



Helping to Make MODERN MOTOR EFFICIENCIES POSSIBLE

The efficiency of the power plant in the modern motor car at which the buying public marvels has been brought about by consistent engineering development and improvements . . . not the least of which was the perfection of the Sylphon Thermostat.

That simple little device now the standard thermostat of America's leading automotive manufacturers, makes possible the accurate control of circulating water temperatures . . . has aided materially in the development of today's efficient engines.

THE FULTON SYLPHON CO.
KNOXVILLE, TENN.

Sylphon
TRADE MARK
THE Standard
THERMOSTAT

AUTOMOTIVE INDUSTRIES

THE AUTOMOBILE

Reg. U. S. Pat. Off.
Published Weekly

Volume 78

Number 17

JULIAN CHASE, Directing Editor
HERBERT HOSKING, Editor
P. M. HELDT, Engineering Editor J. B. POLLOCK, Ass't Editor
JOS. GESCHELIN, Detroit Technical Editor GEOFFREY GRIER, Art Editor
J. A. LAANSMA, Detroit News Editor MARCUS AINSWORTH, Statistician
JEROME H. FARRIS, Ass't Editor L. W. MOFFETT, Washington Editor
H. E. BLANK, JR., Ass't Editor JAMES G. ELLIS, Washington Editor

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C. A. MUSSELMAN, Pres.; J. S. HILDRETH, Vice-Pres. and Manager, Automotive Division; G. C. BUZZY, Vice-Pres.

OFFICES

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Chestnut and 56th Streets, Philadelphia, Pa., U. S. A.

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April 23, 1938

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AUTOMOTIVE INDUSTRIES

Labor

Fresh Flare-Up of Strikes as UAW Pickets Seek Dues

A wave of strikes and other work disruptions attributed to union activities which for a time showed signs of assuming serious proportions in the Flint and Detroit automotive areas, appeared to be settling down toward the end of the week although the situation remained critical in several spots.

Prompt action by William S. Knudsen, General Motors' president, in announcing that plants would remain closed until the UAW removed picket lines, which had been formed to collect dues and had prevented workers from entering in sufficient numbers to operate production lines, alleviated conditions in Flint where two Fisher Body plants as well as the Buick division had been affected.

The Fisher local of the UAW had picketed the Fisher No. 1 plant in Flint on Monday in a dues collection drive which prohibited sufficient numbers of non-dues-paying union members and non-union workers from entering to permit operation of production lines with a resultant closing of the plant for the day by the management. When the picket line was repeated on Tuesday with the same results the plant was again closed and Knudsen announced from Detroit that plants would not be re-opened until the picket lines were removed. Thirty-seven hundred workers were affected including 1500 on the Buick production line who could not work because bodies were not available.

The union announced it would call off its picket lines and the Fisher plant was scheduled to resume operations on Thursday. Action by the Flint union in withdrawing pickets resulted from recommendations made to it by Homer Martin, UAW president, after he in turn had heard from Governor Frank Murphy and James F. Dewey, Federal labor conciliator, who urged that production stoppages be prevented.

Meanwhile Buick, Fisher and



GEORGE D. SHAEFFER

... has been named chief engineer of the road machinery division of Gar Wood Industries, Inc. Mr. Shaeffer was chief engineer for the past 11 years of the road machinery division of the W. A. Riddel Corp. and was also with the Allis-Chalmers Mfg. Co.'s road machinery division for several years.

Chevrolet union members began balloting on Wednesday on a proposal to strike in protest against alleged discrimination and violation of seniority rights, because of the alleged employment of foremen and former office workers on production lines.

A dispute on the motor line at the Plymouth division of Chrysler Corp. affected production of the late shift in that department for one day this week. About 200 men were affected but the balance of the shift, 1400 men, continued to work. The dispute involved a UAW committeeman who had been disciplined for leaving his post repeatedly without notifying his foreman. Herman L. Weckler, vice-president in charge of industrial relations for Chrysler charged viola-
(Turn to page 560, please)

Production

Estimated Gain of 5000 Units Over Preceding Two Weeks

Car and truck production during the week ending April 22 will show a gain of approximately 5000 units over the previous two weeks in the month according to preliminary estimates based on information available before the end of the week.

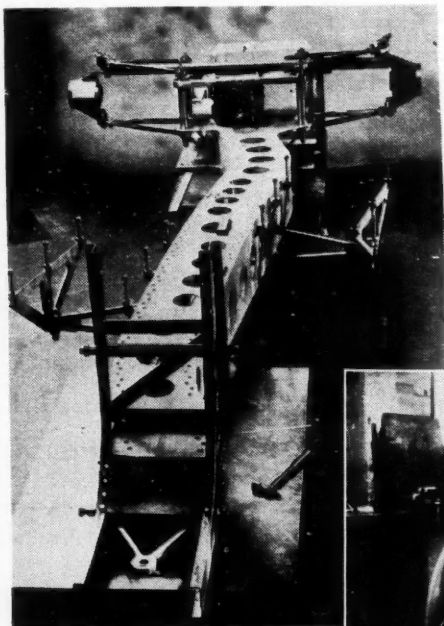
The increase reflects continued improvement in retail deliveries during the earlier weeks of the month and was achieved in spite of production stoppages caused by strikes and labor difficulties affecting Buick and Plymouth.

Production in a number of plants is reported to be lagging slightly behind retail sales, which are now definitely responding to seasonal influences although not to so great an extent as in a normal business year. The lag is attributed entirely to efforts on the part of manufacturers to keep stocks of their outlets on an even keel and to provide banks of orders which will permit production to continue at a steady pace.

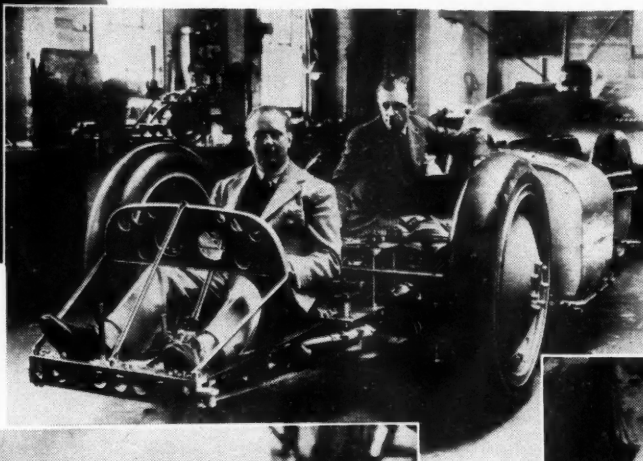
Biggest gains of the week were shown by Chevrolet and Oldsmobile although a slight increase also was indicated at Ford. Chevrolet expected to bring its production up to around 17,500 units this week and Oldsmobile, which went to four days, went up to 2400 units. Buick, which has been maintaining a dominant position, expected to be off slightly because part of its operations were affected by closing of the Fisher Body plant which could not produce because of union dues-collecting pickets.

Total production for the week is estimated at 64,500 cars and trucks which will bring the estimated total for April to date to better than 180,000 units and indicates that the industry probably will approach the 250,000 mark for the month, an increase of 15,000 units over March which had the advantage of five productive weeks.

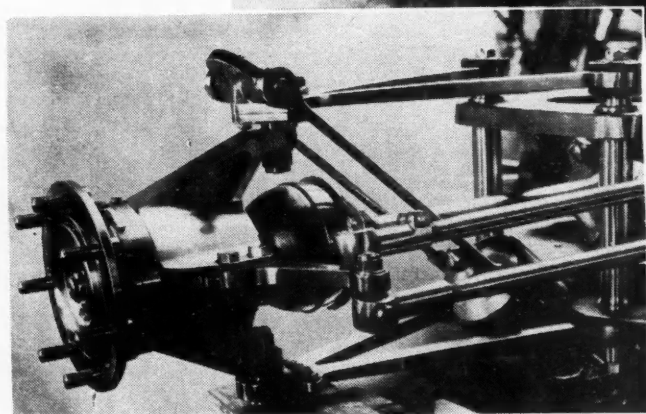
Biggest contributor to this week's
(Turn to page 564, please)



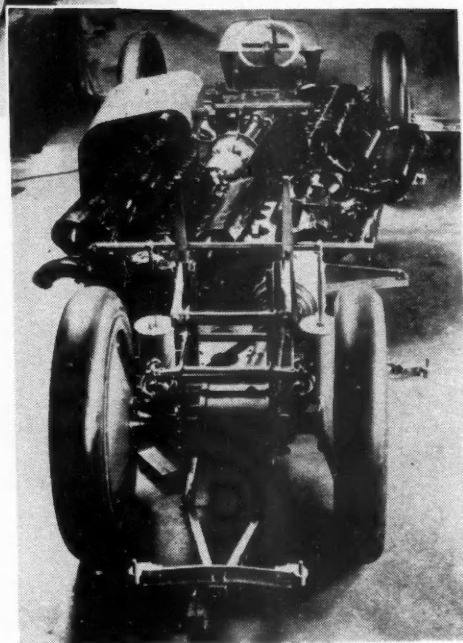
(Above): Rear view of chassis frame



(Left): John Cobb and Reid Railton pictured with the chassis of the new racing car.



(Above): Close-up view of the hub and front wheel suspension



Globe Photos

A new racing car designed to break the world's land speed record is being built for the well-known British speed pilot John Cobb, from designs by Reid Railton. The record, which is now held by Capt. George Eyston, stands at 311.42 m.p.h., and the new car is designed to do 350 m.p.h. The attempt is to be made at Bonneville in Utah, where the present record also was established.

A number of photographs of the new car are shown herewith. It is equipped with two Napier aircraft engines of 1250 hp. each. One of these engines drives through the front, the other through the rear wheels. For cooling, water and ice will be carried in a 75-gal. tank. The weight of the car is given as three tons, and the weight/power ratio figures out to 2.5 lb. per hp. The top

gear ratio is 1.35 to 1 so that the drive wheels will make approximately three revolutions to four of the engine crankshaft.

Cobb will sit in the front of the car as though in the nose of a glass-paned projectile. The body or shell is shaped like a whale, without exterior projections. Evidently with a view to improving the streamlining, the rear tread is made much smaller than the front tread, the former being 42 in. and the latter 66 in.

Reid Railton is no novice in the field of record-car design, having specialized in that field for the past seven years, and an article on the subject from his pen appeared in *AUTOMOTIVE INDUSTRIES* of May 29, 1937.

... slants

OBSOLESCENCE—A survey which sought data on the obsolescence of machine tools was conducted recently by the Warner & Swasey Co., Cleveland, and served to establish the following: "More machine tools were purchased by industry in the last two years for expansion than for replacement; smaller companies forged ahead more rapidly than larger companies in purchases of machine tools during the same period; and, total buying of new machine tools, for both expansion and replacement in the two-year period, has been at the

February New Car Registrations Lagged '37 by 43.8 Per Cent

Registrations* of 117,730 new passenger cars in February represented only 43.8 per cent of the total reached in the same month of 1937, and fell off 24,594 units from the January, 1938, figure.

Comparison of the total new registrations dur-

ing the first two months of this year with the same period last year shows a decrease of 46.1 per cent.

For the four months of the model year 1938, new registrations amounted to 625,059.

	FEBRUARY	JANUARY	FEBRUARY	TWO MONTHS		Per Cent Change, 2 Months, 1938 over 1937	Per Cent of Total Two Months		FOUR MONTHS MODEL YEAR		Per Cent Change
	1938	1938	1937	1938	1937		1938	1937	1938	1937	
Chevrolet	29,003	33,618	29,118	62,621	83,764	-25.2	24.06	17.31	164,896	224,110	-26.5
Ford	27,118	35,295	60,245	62,413	125,718	-50.4	24.00	25.98	108,205	214,449	-49.5
Plymouth	14,196	17,179	38,704	31,375	81,150	-61.4	12.06	16.78	79,728	168,443	-52.6
Buick	9,085	11,059	6,024	20,144	20,934	-3.7	7.75	4.33	53,053	57,849	-8.2
Dodge	6,530	7,672	20,263	14,202	41,792	-66.0	5.46	8.64	39,114	82,863	-52.8
Pontiac	6,043	7,090	8,582	13,133	24,414	-46.1	5.05	5.05	35,404	55,770	-36.5
Oldsmobile	5,723	6,622	6,673	12,345	21,442	-42.3	4.75	4.43	31,894	45,082	-29.0
Chrysler	3,099	3,827	5,806	6,926	12,209	-43.3	2.66	2.52	19,001	24,293	-21.7
Packard	3,212	3,408	6,465	6,620	12,911	-68.7	2.55	2.67	17,184	27,076	-36.4
Hudson	2,835	2,845	7,220	5,680	15,570	-63.5	2.18	3.22	14,710	32,109	-54.1
De Soto	2,201	2,796	4,833	4,997	9,804	-49.0	1.92	2.03	13,963	18,758	-25.5
Studebaker	2,328	2,649	4,589	4,977	9,425	-47.0	1.91	1.95	12,436	21,361	-41.6
Nash	1,945	2,624	3,784	4,569	8,006	-42.9	1.76	1.66	11,178	15,658	-28.6
Lincoln	1,250	1,712	1,675	2,962	3,412	-13.0	1.14	.71	6,354	7,095	-10.4
Willlys	1,037	1,351	2,388	2,388	5,832	-59.0	.92	1.21	6,752	7,508	-10.0
La Salle	799	1,062	875	1,861	3,070	-39.4	.72	.63	5,230	7,476	-30.0
Cadillac	795	792	560	1,587	1,697	-6.5	.61	.35	2,826	4,010	-29.5
Graham	357	532	875	889	1,824	-51.3	.34	.38	2,222	4,301	-48.4
Hupmobile	71	81	152	152			.06		377	22	-87.5
Pierce-Arrow	2	5	31	7	68	-89.8	.01	.01	21	168	-87.5
Miscellaneous	101	105	267	206	668	-69.1	.08	.14	511	2,519	-79.5
Total	117,730	142,324	209,863	260,054	483,710	-46.1	100.00	100.00	625,059	1,020,922	-38.7
Chrysler Corp.	26,026	31,474	69,606	57,500	144,955	-60.3	22.11	29.97	151,806	294,357	-48.4
Ford and Lincoln	28,368	37,007	61,920	65,375	129,130	-49.5	25.14	26.69	114,559	221,544	-48.3
General Motors	51,448	60,243	111,691	155,321	286,221	-46.2	42.95	32.11	293,303	394,297	-25.5
All Others	11,888	13,600	26,525	25,488	54,304	-53.0	9.80	11.23	65,391	110,724	-41.0

* Does not include returns for Wisconsin. All data are comparable.

average rate of only 4.8 per cent a year."

RAIL REVENUE—At a meeting of traffic managers, members of the Automobile Manufacturers Association, held in Detroit last week, it was reported by J. S. Marvin, chairman of the conference, that shipments of automobiles, trucks, parts and tires in 1937 produced freight revenues of \$129,280,148 for the railroads. It required 767,869 freight cars to transport these shipments.

Keller Reports Chrysler Sales 40 Per Cent of Normal

Stating that developments since February had justified the action of Chrysler directors in deferring a dividend declaration for the first quarter of the year, K. T. Keller, president of the corporation, pointed out to stockholders at the annual meeting in Detroit this week that retail sales of the corporation for the first seven weeks of 1938 were approximately 40 per cent of normal. While sales have been rising since that time about 10 per cent each week as compared with the preceding week, the trend continues around the 40 per cent level, he said.

"There has been some pickup in the business of Chrysler since February, but it has been less than seasonal," stated Mr. Keller.

Akron Mayor Enters Labor Fray

Urges Plantwide Referendum on Goodrich Wage Cut Proposal; Miller Hour-Wage Stabilization Program Being Studied

While tire industry executives and officials of the United Rubber Workers pondered the hour-wage stabilization program proposed for the tire industry by James P. Miller, regional director of the National Labor Relations Board, Mayor Lee D. Schroy of Akron stepped into the Goodrich-URW wage-hour controversy by issuing an open letter in which he called upon Goodrich and the union to come to an immediate agreement and urged an early plantwide referendum of Goodrich Akron employees upon the company's proposal that wages be reduced approximately 17½ per cent to avert the possible transfer of 5000 jobs from Akron to Goodrich subsidiary plants. The vote on the Goodrich ultimatum, originally scheduled for March 20, was canceled upon protest of Akron civic leaders who claimed it should embrace all affected employees and not merely paid-up members of the United Rubber Workers Union.

With the backing of 19 Akron civic and business organizations, in the form of resolutions urging early settlement of the dispute, Mayor Schroy declared that "it is the right

of all citizens of Akron to unite in insisting that the management and the union conclude some agreement and submit it to a vote." The resolutions urge that the vote be taken at once, that it include all affected employees, and that it be neutrally supervised. Goodrich officials have declared that unless their employees submit to a substantial wage cut, they will be forced to move 5000 jobs away from Akron. Goodrich, Goodyear and Firestone, April 1, reduced all salaries 10 and 20 per cent. Commitments involving expenditure of \$1,500,000 for plant improvement in Akron which Goodrich had made conditioned upon acceptance of the wage cut, were withdrawn by the company last week.

Meanwhile union leaders renewed their request to the Department of Labor at Washington that it institute a study of wages and hours in the tire industry. The renewal of the URW petition came after Government officials had sidestepped the issue by indicating that lack of funds would make an immediate survey impossible.

(Turn to page 563, please)



SAMUEL C. EARLEY, for many years active in the Acklin Stamping Co., as superintendent and sales engineer, has been named plant manager of the Logan Gear Co., succeeding **V. R. DRUM** who resigned to accept a position with the Ryerson and Haynes Co., Jackson, Mich.

VINCENT BENDIX announced this week his resignation as chairman of the board of directors of the Automatic Products Corp. of Chicago.

HAROLD J. SKIDMORE, formerly assistant superintendent of the Detroit plant of the Morse Chain Co., subsidiary of Borg-Warner Corp., has been appointed factory manager and superintendent. Mr. Skidmore, who was formerly with the Northway Motor Co., succeeds **C. B. MITCHELL**, resigned.

L. D. WORDEN has been made assistant sales manager in charge of industrial products manufactured in the Detroit plant of the Morse Chain Co. Mr. Worden was formerly associated with the W. A. Jones Foundry and Machine Co.

EDWARD J. BEGUHN has been named regional sales manager of the Hudson Motor Car Co. in the central region which includes the states of Illinois, Iowa, Kansas, Missouri, Nebraska, Minnesota, and North Dakota.

ALFRED P. SLOAN, JR., chairman, General Motors Corp., will be the guest speaker at the annual banquet of the National Automobile Dealers Association which will be held in Detroit, April 27. Mr. Sloan has chosen as his subject, "The Dealer, the Manufacturer and the Consumer." Arrangements have been completed to broadcast the address over a nationwide radio hookup (NBC Blue network) at 9:00 p. m. eastern standard time.

RAYMOND SZYMANOWITZ, newly appointed vice-president and technical director of Acheson Industries, Inc., will speak on the subject of colloidal graphite before the Michigan-Northwestern Ohio section of the American Ceramic Society, May 6, at Jackson, Mich.

HAROLD C. HOUGHTON, for the last five years Nash district manager in the Detroit area, has been appointed general manager of Nash Motors of Cincinnati, Ohio.

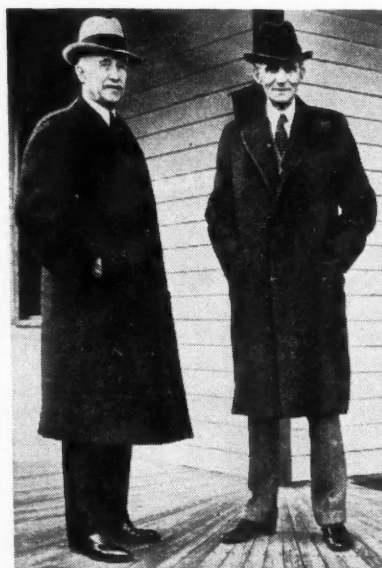
A. J. VANHECKE, who has been district manager of the Chicago branch territory for the Studebaker Corp., has been promoted to assistant manager in the Philadelphia branch. Other recent Studebaker appointments include **JAMES B. MOORHEAD**, new district manager to cover the central Illinois territory, and **LOUIS HARPOLE**, formerly in the dealer development division at the home office and transferred to the Chicago branch to cover the Omaha territory as district manager.

DR. GERALD L. SIMARD has become a research associate at Battelle Memorial Institute, Columbus, Ohio, where he will investigate the use of electron diffraction methods in the study of oil films.

S. F. WOODELL, advertising manager of Packard Motors Export Corp., has been elected president of the International Advertising Association, which was recently organized to "coordinate and foster the practice of international advertising in all its phases."

City Auto Shows First Quarter Loss

City Auto Stamping Co. and subsidiaries report a loss of \$4,185 for the first quarter of 1938. The organization showed a net profit of \$44,242 or 12 cents per share for the same period last year.



Acme photo

PIONEERS of the aircraft and automobile industries, Orville Wright (left) and Henry Ford, pictured on the porch of the old home in which the Wright brothers lived in Dayton, Ohio, while carrying out their early experiments. The building, has been reerected at Henry Ford's Greenfield Village in Detroit and, along with other buildings and equipment used by the Wright brothers, was rededicated on April 16 at ceremonies honoring Orville Wright and memorializing his late brother, Wilbur, on the seventy-first anniversary of Wilbur's birth.

Labor

(Continued from page 557)

tion of paragraph 4 of the company's agreement with the union which provides—"The union will not cause or permit its members to cause, nor will any member of the union take part in, any sitdown or stay-in strike or other stoppage in any of the plants of the corporation during the term of this agreement."

About one-third of the 200 men affected had stopped work on the motor line because the committeeman was disciplined.

Other Strikes

Other strikes in effect in the Detroit area during the week involved the American Brass Co., which closed its plant affecting 750 employees because power had been shut off by power house employees in a dispute over a 10 per cent wage reduction, a slow down at Kelsey Hayes, three plants of the Bohn Aluminum and Brass Corp., the Detroit Moulding Corp., and the Michigan Steel Castings Co. According to Martin, none of the strikes had been authorized by the international union but such authorization might be given if circumstances warrant after investigations are made. A new contract per-

mitting the UAW to bargain for its members only has been signed with the Murray Corp. of America, while negotiations are still underway at Briggs and Hudson where former contracts have expired.

Knudsen Statement

The following statement was made by **W. S. KNUDSEN**, president of General Motors Corp.:

"The General Motors Corp. condemns this latest method by the United Automobile workers of America of coercing employees and denying them entrance to the plant and their right to work at Fisher Body Division No. 1 at Flint, Mich. Several hundred employees were physically prevented from entering the plant this morning.

"The corporation has kept its agreement with the union. It has no demands before it dealing with the Flint situation. It does not propose to overlook this latest development to obtain a closed shop by coercive methods. Men can work in our plants whether they belong to the union or not. The agreement expressly states that there shall be no coercion or intimidation of any kind.

"The corporation will take the only way of meeting this latest breach of faith by the union, namely, to let the plant remain closed until the practice is stopped and picket lines withdrawn."

House Moves to Stop Diversion Of Fuel and Vehicle Taxes

Legislation requiring States' to discontinue the practice of diverting gasoline and motor vehicle taxes for purposes other than road construction and maintenance is being planned in the House Roads Committee and slated for introduction at the next session of Congress.

Details of the legislation have not been disclosed but it is understood that States which divert tax receipts would be disqualified from receiving Federal highway aid funds. A similar weapon is proposed under the pending Cartwright bill which prescribes safety measures to be enacted before the State applicant for Federal highway funds is qualified to receive them.

"When a State diverts the gasoline and automobile taxes to other purposes and fails to match Federal-aid road funds, and the roads are not constructed, it is curbing and interfering with the Federal-aid system," declared Congressman Dowell, Republican, of Iowa, when the House voted last Tuesday to double a \$100,000,000 appropriation which had previously been approved for State highway aid.

"It is intended that the Federal-aid funds shall be used in the construction of roads throughout the Federal-aid system, and it is intended that the several States will match these funds and construct the roads out of gasoline and automobile taxes." (next page, please)

Chairman Cartwright, of the House Roads Committee, has given his approval to such legislation and is expected to actively sponsor the move as is also John J. Cochran, Democrat, of Missouri.

That the Federal Government does not have a clear record in the diversion of tax funds received on automobiles, trucks, gas, oil and tires, and is, therefore, in no position to lay down such a ruling was pointed out by Representative Mott, Oregon Republican, also a member of the House Roads Committee. He submitted figures showing tax collections aggregate \$359,948,439 annually on automobiles, trucks, motorcycles, gasoline, oil, tires, tubes, automobile parts and accessories. Total authorizations per year for the next two years are at the rate of \$283,000,000 for Federal highway aid.

In other words the Federal Government could be said to be diverting close to \$77,000,000 each year for other than road construction and maintenance costs. Even Congressional members who oppose diversion of tax funds insist that the Federal gasoline tax, on which is collected about \$180,000,000 annually, was never intended to be used exclusively for the construction of roads. Nevertheless they do not deny that the Federal Government itself is the greatest diverter of gasoline-tax funds.

It has been estimated that approximately \$165,000,000 in gasoline taxes alone are being diverted yearly from highway construction and maintenance.

Rise in Orders Reported by Hudson Motors of Canada

Ross MacKinnon, vice-president of Hudson Motors of Canada, Ltd., states that there has been a continuous rise in orders since the week of March 7, which by the end of the week of April 11 represented a total gain of 136.6 per cent. Shipments and orders for 1938 models until and including the week of April 11 exceeded the total for the same period last year by 9.27 per cent.

Cadillac Dealer Ranks Expand

The most active period of expansion in Cadillac-LaSalle dealer ranks in more than two years was reported this week by D. E. Ahrens, general sales manager.

During the past month, Mr. Ahrens said, 56 new dealers from all sections of the country have been added to the Cadillac-LaSalle roster.

The 1940 Census

Bureau to Seek Detailed Data In "Metropolitan Districts"

Laying plans for the sixteenth Decennial Census to be taken in 1940, the Bureau of the Census has announced its intention of setting up "metropolitan districts" where statistics will be sought in greater detail and variety to permit manufacturers and distributors to concentrate their promotional activities on areas which offer the greatest possibilities.

"Metropolitan districts" were established under the 1930 population

tions. Included are Dr. Paul T. Cherrington, chairman, New York City, marketing and advertising representative; T. W. Howard, of the U. S. Chamber of Commerce who also represents manufacturers; and Dr. Ralph J. Watkins, of the Bureau of Business Research, University of Pittsburgh.

Their job will be to draw up a questionnaire in an effort to obtain an improved social-economic index of a community, distribute the form to trade associations, manufacturers, distributors, statisticians and others, and hold hearings to solicit additional information.

More Shifts in Chevrolet Zone Organization

Supplementing recent announcements of field promotions and transfers, W. E. Holler, general sales manager of Chevrolet, this week announced six additional changes in the company's zone organization.

J. L. Connell, who has been zone manager at Des Moines, Iowa, since Dec. 1, 1936, has been promoted to the corresponding post in New Orleans. He succeeds Earl S. Graham, who becomes zone manager at Houston Tex. The latter takes the position vacated by I. X. Sarvis, whose appointment as Midwest assistant regional manager in charge of used car operations was recently announced.

E. J. McClees, manager of the Detroit zone since March, 1937, and for three years before that manager of the Flint zone, has been named Des Moines zone manager succeeding Mr. Connell. Mr. McClees' former post in Detroit is filled by R. E. O'Brien, for the past two and a half years city sales manager at that point. Mr. O'Brien has been with the company since 1932, serving at Norwood, Ohio, and Detroit.

C. W. Wood, former service and mechanical manager, becomes zone manager at Davenport, Iowa, following the transfer of R. C. Watson, former manager at that point, to special assignments in the Great Lakes region with headquarters in Janesville, Wis.

Hudson Announces Deluxe "112"

Hudson has announced a new deluxe "112." The new model is powered by the Hudson six-cylinder, 83-hp. engine. Bodies available include: brougham, touring brougham (with trunk), sedan, touring sedan (with trunk), three-passenger coupe, convertible coupe, and convertible brougham.



EMERSON FRANTZ

... has been named general sales manager of the Bohn Aluminum and Brass Corp. Mr. Frantz has been with the Bohn organization since its formation. In 1915 he joined the General Aluminum and Brass Mfg. Co., which was consolidated in 1924 with the Chas. Bohn Foundry Co. to form the present corporation.

Mr. Frantz has been active in both production and sales and when the present corporation was established, he was placed in charge of sales of the bearing division. In 1933, he was made manager of the bearing division in complete charge of production and engineering, a position which he held up to his recent appointment as general sales manager.

census but were largely based on population needs and consequently comprised large centers and the adjacent urban areas. Commerce Secretary Roper reports that business groups throughout the country have asked that the scope of such districts be broadened by seeking a greater variety of statistics and by increasing the number of districts.

A committee has been designated to survey the problem and draw up specifications and make recommenda-

Business in Brief

Written by the Guaranty Trust Co., New York

A further reduction in general business activity occurred last week. The index compiled by the *Journal of Commerce* stood at 70.3, as compared with 70.5 the week before and 99.4 a year ago. Declines were registered in car loadings, petroleum runs to stills, and lumber and steel production. Bituminous coal production rose sharply, and automotive activity increased after three successive declines. Retail trade advanced, with the volume exceeding that a year ago from 2 to 5 per cent.

Railway freight loadings during the week ended April 9 totaled 521,978 cars, which marks a decline of 1511 cars below those in the preceding week, a decrease of 189,101 cars below those a year ago, and a drop of 99,865 cars below those two years ago.

Retail food costs increased 0.2 per cent during the month ended March 15, according to the Department of Labor. The rise was due to an increase of 2.5 per cent in the cost of meat; other groups were either slightly lower or unchanged. Store chain sales during March declined contrary to the usual seasonal movement. The index of sales compiled by the *Chain Store Age* stood at 103.3

for the month, as compared with 106.4 the month before and 108.6 a year ago. This index makes adjustment for the shift in the Easter season.

Production of electricity by the electric light and power industry in the United States during the week ended April 9 was 8.5 per cent below that in the corresponding period last year.

Production of lumber during the week ended April 2 stood at 51 per cent of the 1929 weekly average. There was a substantial reduction in the levels of shipments and new orders, while production was moderately lower than the week before.

Professor Fisher's index of wholesale commodity prices for the week ended April 16 stood at 81.1, as compared with 80.9 the week before and 81.2 two weeks before.

The consolidated statement of the Federal Reserve banks for the week ended April 13 showed an increase of \$2,000,000 in holdings of discounted bills. Bills bought in the open market and Government securities remained unchanged. Money in circulation declined \$14,000,000, and the monetary gold stock rose \$22,000,000.

automatic overdrives and for the G.M. automatic transmission were reversed. In the table on that page the first combination of ratios is that used in G.M. cars with the automatic transmission while the second combination is the average for cars now carrying automatic overdrives.

Exports to Belgium Near 1929 Level

Exports of automobiles, parts and accessories to Belgium in 1937 were valued at \$21,589,000, the highest point reached since 1929.

The Bureau of Foreign and Domestic Commerce, of the Commerce Department, reported that exports in this category represented the largest export item and amounted to 23 per cent of all U. S. exports to Belgium in 1936.

Belgium, which serves as a large assembling and re-export center for other European countries, imported from the United States motor trucks and buses valued at \$5,491,000 in 1937 and \$1,654,000 in 1936; passenger cars valued at \$10,387,000 in 1937 and \$6,319,000 in 1936; aircraft and parts valued at \$164,000 in 1937 and \$32,000 in 1936; and other machinery and vehicles valued at \$2,993,000 in 1937 and \$1,695,000 in 1936.

\$298,000,000 for Roads

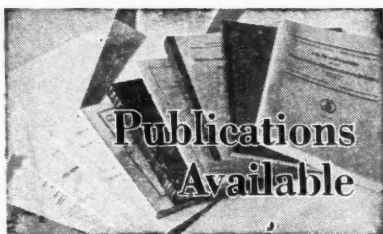
"Pump-priming" Program Would Maintain Five-Year Average

Federal highway aid to States would be maintained at the \$298,000,000 annual average rate prevailing during the last five years under the Administration's new \$4,500,000,000 pump-priming recovery program outlined by the President last week in a message to Congress.

If Mr. Roosevelt's suggestion is followed to the letter, about \$200,000,000 would go to the States for highway construction during the fiscal year 1939 but projects covered by half that amount would have to be started during 1938.

In a move to reduce governmental expenditures, the President proposed last November that only \$100,000,000 be allocated for road building in the fiscal year 1939 and that hereafter Federal funds be limited to \$125,000,000 annually.

Chairman Cartwright, of the House Roads Committee, later introduced a bill calling for Federal expenditures at the current level but the House Appropriation Committee subsequently reported out a bill



Remarks of P. W. Litchfield, president of the Goodyear Tire & Rubber Co., at the annual meeting of stockholders, held March 28, have been published in pamphlet form.

A pocket-size book, which gives complete listings and descriptions of "certified steels" and allied products carried in stock by Joseph T. Ryerson & Son, Inc., has been published by that company.

Engineering bulletin No. 38, covering the subject of flexible shafts for remote control, has been issued by the industrial division of the S. S. White Dental Mfg. Co.*

* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

Appropriation of \$50,000 Final Hurdle for FTC Probe

President Roosevelt's signature last week of the Withrow-Minton resolution authorizing a \$50,000 investigation of manufacturer-dealer relations in the automobile industry left a Congressional appropriation of \$50,000 as the only remaining barrier before the FTC launches the inquiry.

Officials at the FTC do not expect the appropriation to be made until almost the closing days of the present Congressional session and insist that, although having some material

on hand useful in the investigation, have laid no particular groundwork for the survey. They have been frequently warned not to anticipate appropriations for particular surveys requested by Congress, according to Commission spokesmen.

Before authorizing the \$50,000 appropriation called for in the approved resolution, the recent trade practice conferences called by the FTC between manufacturers and dealers are almost certain to be a determining factor by the Congress.

Bantam Stops Production Line To Make Plant Improvements

The American Bantam Car Co., Butler, Pa., shut down its production line, April 22, for two weeks for plant improvements. According to Roy S. Evans, president, the production department alone was affected, all other departments continuing in full swing. Production will be resumed May 9.

When manufacturing resumes, the company will start production on a new Bantam commercial trailer. Although the trailer is designed especially for use with Bantam units, it is claimed that it is equally suitable for any other automotive vehicle. Another Bantam newcomer will be a new commercial body type.

Gear Ratios of Overdrives

In the abstract of S. O. White's paper in AUTOMOTIVE INDUSTRIES for April 9, on page 522, the gear ratios given for the cars now fitted with

which complied with the President's desires of last November. Cartwright immediately moved to raise the President's \$100,000,000 figure by an additional \$101,500,000.

A few days later the President, abandoning any further attempt to economize in Government expenditures, announced the details of a proposed recovery plan which also called for a \$100,000,000 boost, bringing Cartwright and the White House into virtual agreement.

In addition to the \$200,000,000 total, PWA has estimated that about \$80,000,000, or 8 per cent of the \$1,000,000,000 which Mr. Roosevelt suggested be loaned without interest to States and subdivisions for permanent public improvements, would go for the construction of streets and highways, bringing 1939 Federal expenditures for road construction to near the \$298,000,000 average.

Goodrich-URW

(Continued from page 559)

The Miller plan which grew out of joint proposals of the NLRB and a group of Akron civic leaders, would guarantee a certain number of hours of work in the tire industry for 52 weeks of the year, with 24 hours a week advance as being a safe minimum average. This would approximate 1248 hours per year. If the worker should work 36 or 40 hours, he would be paid fulltime for the hours worked. If he worked less than 24 hours per week he would be paid the 24-hour guarantee, and be debited for such accumulated hours, under the 24, that he worked. The debit hours would be worked out by the employee at the option of the company. Work in excess of the flexible 36 and 40 hour week would earn overtime at time and a half rates. The guarantee would be \$1,497.60 a year on the 24-hour minimum for

Two Month's Truck Registrations Off 33.1 Per Cent

Total new truck registrations* during February amounted to slightly less than 66 per cent of the number marked up in the same month during 1937, and sank below the January, 1938, total by 4374 units.

Per cent shift in new truck registration totals for the first two months of 1938 as compared with the same period of 1937 amounts to a minus 33.1 per cent.

	February	January	February	TWO MONTHS		Per Cent Change, 2 Months 1938 over 1937	Per Cent of Total Two Months	
	1938	1938	1937	1938	1937		1938	1937
Chevrolet	8,991	10,137	7,777	19,128	21,752	- 7.0	32.80	24.90
Ford	7,687	9,114	16,100	16,801	32,330	- 48.0	28.81	37.02
International	3,763	4,501	5,136	8,264	11,234	- 25.4	14.17	12.86
Dodge	2,622	3,070	4,904	5,682	8,577	- 33.6	9.76	9.82
G. M. C.	1,401	1,746	2,987	3,147	5,736	- 45.0	5.40	6.57
Plymouth	562	668	692	1,230	900	+ 37.0	2.11	1.03
Diamond T	338	335	580	673	1,408	- 52.1	1.15	1.61
White	272	258	357	530	828	- 36.0	.91	.95
Mack	217	254	363	471	745	- 36.7	.81	.85
Reo	182	216	305	398	649	- 38.5	.68	.74
Willys-Overland	138	176	57	314	182	+ 72.6	.54	.21
Studebaker	144	158	215	302	382	- 21.0	.52	.44
Federal	109	118	205	227	404	- 43.7	.39	.46
Autocar	95	129	112	224	242	- 7.4	.38	.28
Hudson	81	99	355	180	633	- 71.6	.31	.72
Brockway	57	64	115	121	217	- 44.2	.21	.25
F. W. D.	27	66	36	93	66	+ 41.0	.16	.08
Divco	38	45	89	83	169	- 51.0	.14	.19
Indiana	44	30	181	74	293	- 74.8	.13	.34
Stutz Pak-Age Car	34	13	40	47	111	- 57.6	.08	.13
Stewart	19	27	101	46	190	- 75.8	.08	.22
Fontiac	16	18		34			.06	
Sterling	9	16	25	25	47	- 46.8	.04	.05
Miscellaneous	123	85	127	208	246	- 15.5	.36	.28
Total	26,969	31,343	40,859	58,312	87,341	- 33.1	100.00	100.00

* Does not include returns for Wisconsin. All data are comparable.

the employee with a \$1.20 hourly rate and \$998.40 per year or \$19.20 per week for the employee on an 80 cent hourly rate.

A bonus plan is proposed to share the productive wealth created with the workers. The plan suggests that 20 per cent of net earnings, after a 6 per cent dividend for stockholders and other charges, be distributed to all company employees.

The 15 major points of the program provide:

1—Establishment of an industry-wide coordination commission to handle grievances.

2—Guarantee of an annual minimum wage.

3—Distribution of an earned wage bonus annually.

4—Establishment of a flexible

work week.

5—Guarantee of proportional distribution of available work.

6—Proportional employment of Akron workers in new plants built elsewhere.

7—Classification of employees into permanent and casual groups.

8—Vacations with minimum pay during certain months of the year.

9—Installation of improved machinery in the Akron plants.

10—Guarantee of efficient performance by workers.

11—Minimum and maximum limitations of production hour schedules.

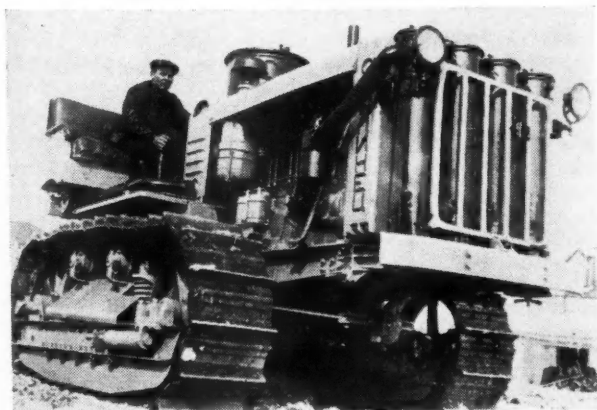
12—Adoption of a uniform layoff and reemployment plan.

13—Establishment of unit base rates for a definite period.

14—Establishment of strict divisional seniority plan.

15—Establishment of uniform grievance procedure.

Pointing to the fact that Akron produced 60 per cent of the rubber goods manufactured in the United States five years ago, and that this share declined last year to 37½ per cent, largely through decentralization which took 15,000 rubber jobs away from Akron, Mr. Miller suggests that Akron be guaranteed a substantial proportion of the rubber production. He further suggests that Akron workers be given preference up to 50 per cent in hiring employees for new rubber plants elsewhere.



Acme Photo

Automotive Industries

CHEAP GAS

One of the new Soviet tractors built at the Chelyabinsk plant in Russia is pictured at the right during a trial run. The tractor's 75 hp. engine uses a highly combustible gas for fuel which is generated on the tractor from low-cost raw material.

Production

(Continued from page 557)

totals will be General Motors with an estimated 24,900 cars and trucks, followed by Ford and Chrysler with estimates of 15,500 and 14,900, respectively. There was slight change in the schedules of independent producers.—J. A. L.

Plymouth Adds 7-Passenger Model

A new seven-passenger model was added this week to Plymouth's 1938 line. It is a four-door touring sedan with built-in trunk and has a wheelbase of 132 in., measuring slightly more than 214 in. from bumper to bumper.

Gear ratio of the new model has been increased from 4.1 to 1 of other 1938 Plymouth cars, to 4.3 to 1.

Bohn Strike Hits All Plants

Five remaining plants of the Bohn Aluminum & Brass Corp. were added to the three already on strike, when workers voted Wednesday night to strike in sympathy with those already out. The company charged that the union, a UAW local, had refused to live up to the negotiating procedure called for in their agreement which requires that 10 days be spent on negotiations before strikes are called. As a result the com-

pany had refused to negotiate until the striking workers in three plants had returned to work, but the union replied to this stand by voting strikes in all Bohn plants in the Detroit area.

Ford-Roosevelt to Chat

White House Conference Set For Next Wednesday

President Roosevelt and Henry Ford will sit down at a White House luncheon next Wednesday. The White House announced that the President telegraphed Mr. Ford at South Sudbury, Mass., on Wednesday, inviting the motor executive to be his guest. From South Sudbury Ford said he had accepted the invitation. In his telegram the President told Mr. Ford that he could also bring his son Edsel and W. J. Cameron, Ford's public relations counsel, if he wished to do so.

Neither the White House nor Ford would say what will be discussed at the White House session.

In an interview, Ford is quoted as saying that he will go to Washington to let the President "look at someone who doesn't want anything and also doesn't want to give any advice."

Ford, according to a United Press dispatch, said that the conference would be a "renewal of old acquaintanceship," extending back to the days when Mr. Roosevelt was Assistant Secretary of the Navy.

In extending the luncheon invitation to Mr. Ford, the President said he understood from Hall Roosevelt, brother of the President's wife and former Detroit official, that Mr. Ford planned to be in Washington next Wednesday and that the President would be delighted to have Mr. Ford lunch with him.

Graham Develops Plan to Raise New Capital

Graham-Paige Motors Corp. and a committee of suppliers have worked out a plan for raising \$750,000 in new capital, to be secured by a second mortgage. J. B. Graham, president, has advised stockholders. The plan is subject to the approval of creditors and also calls for extensions on accounts due suppliers.

Pontiac's Klingler Reports On Dealer Survey

After five weeks of travel through the Southwest, the South and the Pacific Coast region visiting over 300 Pontiac dealers, H. J. Klingler,

general manager of Pontiac Motors Division, reported that "The average Pontiac dealer today is in fairly good shape as to new and used car inventories. For the first time since December new car inventories are under control. Orders are coming to the factory at a considerably faster rate.

"However, no cars are being built except on dealers' orders. A special method of handling has been set up so that orders received in the sales departments are forwarded to the manufacturing department hourly on days the plant is working. As a result, work is started within two hours of the receipt of car orders and shipment is made to the dealers within a few days."

Houdaille-Hershey Profit Approximately \$30,000

Houdaille-Hershey Corp. and subsidiary companies report for the three months' period ended March 31, 1938, a consolidated net profit of \$29,329.09 after all charges including depreciation, provision for Federal taxes and earnings applicable to minority interest. These earnings compare with a net profit of \$627,113.87 reported for the first quarter of 1937 and amount to \$0.17 per share on the 174,000 shares of class A stock outstanding on March 31, 1938.

To Survey Sentiment on Car Inspection System

Pro and con angles on the present system of motor vehicle equipment inspection in Pennsylvania and suggestions for an alternate system whereby the State would own and operate official stations are advanced in a bulletin which has been prepared by the Pennsylvania Automotive Association in Harrisburg. The association plans to distribute the bulletin to about 8000 inspection station operators throughout the State in the near future.

A questionnaire attached to the bulletin solicits "yes" or "no" reactions to 25 questions based on the controversial subject.

Eaton Shows First Quarter Loss

Eaton Mfg. Co. and subsidiaries reported a net loss of \$199,042 for the quarter ended March 31, 1938, after charges and depreciation. This compares with net profit in the first quarter of 1937 of \$836,779 which equalled \$1.20 per share on 696,146 shares.

40 Years Ago

with the ancestors of
AUTOMOTIVE INDUSTRIES

Gasolene Carriage

"The honor of producing the first gasolene carriage in Canada belongs to W. J. Still, a young inventor of Toronto, who for nearly seven years has devoted himself to the problem.

"The motor weighs 300 lb. and is said to develop 5 hp. The carriage complete weighs 750 lb., and is a regular design of the Canada Carriage Co.

"Speed is controlled by means of a lever, which is moved forward to go ahead and backward to stop. A reverse lever is also provided, as well as two brakes, one operated by foot and the other by the left hand. Steering is accomplished by a hand wheel on the controlling lever."

From *The Horseless Age*, May, 1898.

Clarence E. Cook

Clarence E. "Coxie" Cook, 58, one of the B. F. Goodrich Co.'s best known executives and for many years manager of Goodrich mechanical goods sales, died, April 16, at his Akron residence after a long illness. He had been with the company since 1905 and formerly had charge of all Goodrich branch operations. Funeral services were held April 20 in Akron.

Books

of automotive interest

GRAPHIC ROUTES TO GREATER PROFITS, by John W. Esterline. Published by the Esterline-Angus Company, Indianapolis, Ind.

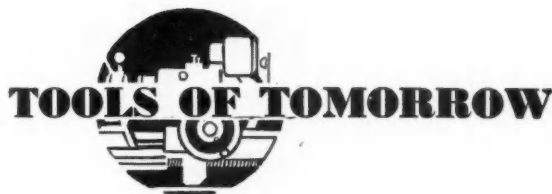
This book deals with graphic instruments, more generally referred to as recording instruments, and their multifarious uses. The use of graphic charts to represent the relations between dependent variables is discussed briefly, the greater part of the book being devoted to specific examples of the use of recording instruments in industry, with a statement of the specific conditions that makes their use advisable, and of the advantages gained. No fewer than 239 such applications of graphic instruments are described.

It appears that graphic charts produced by recording instruments can be used to advantage in the generation, transmission, distribution, sale, purchase and use of power; in the design, selection, operation, and maintenance of machinery, in the development of industrial processes, and in the inspection and control associated with these processes; in shops in measuring productive work, in scheduling performance, and in determining costs, and in connection with inspection, tests, demonstration and sale of industrial products. Graphic instruments are used also in research and scientific work.

A number of the applications described are to welding operations. In a spot-welding job on the dash and cowl of automobile bodies, a record of current vs. time shows the maximum current consumed by each weld, the time intervals between successive welds all in one row, and the time lost in handling the jig. All irregularities in the operation are shown.

The book is handsomely printed and illustrated, and is an altogether creditable production. Its price is \$3.

Automotive Industries



Multiple Rivet Setter

... Automatic machine designed with double riveting heads and an adjustable centering device.

An automatic, multiple, bench-type riveting unit of new design has been brought out by the Chicago Rivet & Machine Co., Chicago. It is provided with double riveting heads and an adjustable centering device. One head remains stationary, while the other can be adjusted quickly in or out by means of a balcrank and lead screw, requiring only a few minutes to change from one center to another.

A 1/4-hp. motor is employed in the drive and a single clutch operates the plunger, providing uniform rivet insertion and closure, as well as eliminating marring of the rivet head or unbalanced tension.

Heads may be operated simultaneously to set two rivets at a time or the feed on either head may be locked to permit single rivet setting where necessary or desirable.

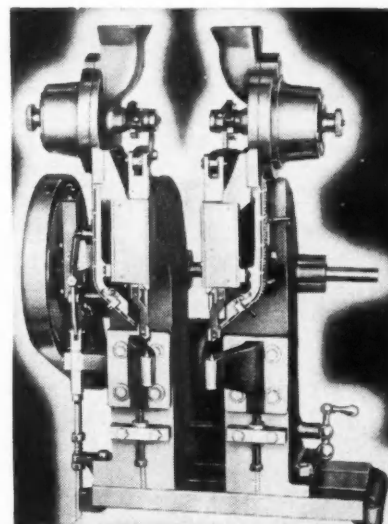
Two models are available, one for light and the other for heavy-duty work.

Vari-Pitch Speed Changer

... Texrope unit offered in capacities up to 33 hp. with ratios as high as 3 3/4 to 1.

Texrope Division of the Allis-Chalmers Mfg. Co., Milwaukee, Wis., has introduced a new speed changer unit which incorporates the principle of the company's multi-groove vari-pitch sheaves.

The totally enclosed unit, designed with double shaft extensions and driven from a standard motor, is said to provide a flexibility that



Chicago Rivet & Machine Co.'s automatic, multiple, bench-type riveting unit

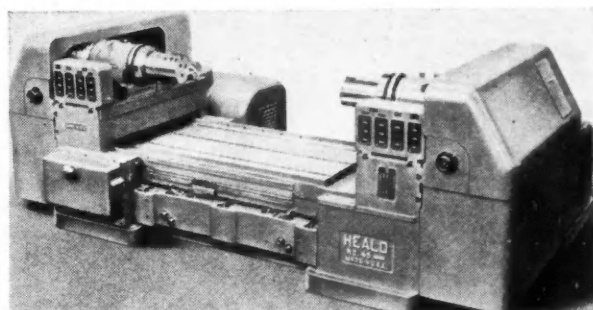
makes it adaptable to a wide variety of layouts to suit individual applications. Where the change in speed is to be adjusted manually only, the unit is provided with a readily accessible hand wheel control. However the unit can be equipped for electric remote control. Manual remote control is also possible.

The present range of capacities now being offered include ratings up to 33 hp. with ratios as high as 3 3/4 to 1.

Precision Boring Machine

... Largest Bore-Matic built by Heald has 30-in. stroke.

Largest precision boring machine built by the Heald Machine Co., Worcester, Mass., is the new Bore-Matic known as the double end No. 45. It can be furnished either single (Turn to page 586, please)



The new double end, No. 45, Heald precision boring machine

April 23, 1938

Automotive Metal Markets

Burgeoning of New Labor Difficulties in Automotive Plants Depresses Steel Market Sentiment

Just as the steel market was beginning to find mild encouragement in reports that western steel mills enjoyed last week the best run of orders this year, news of the outbreak of fresh labor troubles in the plants of Michigan automotive consumers brought apprehension of another set-back.

Due to the practice of finishing mills to permit orders for flat steels to accumulate until half-way satisfying rolling operations are possible, the rate of activity in any one week means little. Primary operations are virtually unchanged this week from last, being reported by the American Iron & Steel Institute at 32.4 per cent of ingot capacity, compared with 32.7 per cent in the preceding week.

One of the disquieting features of the situation is that, in response to the current paucity of finished steel demand, the movement of basic materials is being geared to abnormally low levels; so, for instance, present plans call for only about 50 per cent of the iron ore carrying fleet to operate this year. Should there be a sudden, rather than a gradual bulge in steel demand—and this has happened many times before following periods of extreme depression—paucity of raw material stocks would be speedily reflected in tension in the pig iron market and so on up the line. Bids by cement producers for Government contracts, in which bids the basing point system of pricing is eliminated, have revived discussion of that problem with reference to steel, but no one in the steel market looks for a change from established trade custom in that respect.

Non-ferrous metal markets generally show a trend toward somewhat higher price levels this week. Two causes are held to be responsible. In the first place, prices for some metals had dipped too low to meet with adherence by a representative majority of sellers. In zinc, for instance, there were one or two sellers at quoted prices, but a larger number declared themselves out of the market pending some improvement in price. This came when the price was marked up from 4 to 4¼ cents, East St. Louis, an advance of \$5 a ton and was put across in spite of the fact that demand had not undergone marked expansion and the metal's statistical position continues to be in buyer's favor.

The second cause for the upswing was the lower valuation put abroad upon the dollar, which change made itself especially felt in the tin market. With London and Singapore closed on Monday because of Easter Monday, importers here calculated that, with sterling held at above \$5 and the bullish influence of the improved European political situation, a sharp advance at the reopening of the foreign markets was inevitable. So they marked their price for spot Straits tin up to close to 40 cents on Monday, but when Tuesday's cables came, they found that they had overshot the mark and the price receded to 39 cents. Consuming demand here hasn't improved and dissension over the proposed buffer pool continues to be a disconcerting factor.

Copper gained a stronger undertone as the result of a further increase in foreign demand. Inflation talk also helped. The export price on Tuesday rose to 10.20 to 10.25 cents, and the domestic price was fairly strong at the unchanged 10-cent level, but with no "outside" metal offered at below that level, as had been the case last week.

Demand for lead was moderately improved at unchanged prices.—W. C. H.

G.M. Overseas Sales Up 15%

Sales of General Motors cars and trucks to dealers in the overseas markets during March totaled 37,003 units, the highest March volume on record and a 15 per cent increase above the sales for March of last year. For the first three months of 1938, sales of 97,193 units represented an increase of 12.2 per cent

over sales in the first three months of 1937.

During the 12 months through March, 1938, sales amounted to 374,044 units, an increase of 15 per cent over the volume in the 12 months ended March 31, 1937.

These figures include the products of the corporation's American Canadian, English, and German factories sold outside of the United States and Canada.

Two-Speed Rear Axles Adopted For Three Ford Commercials

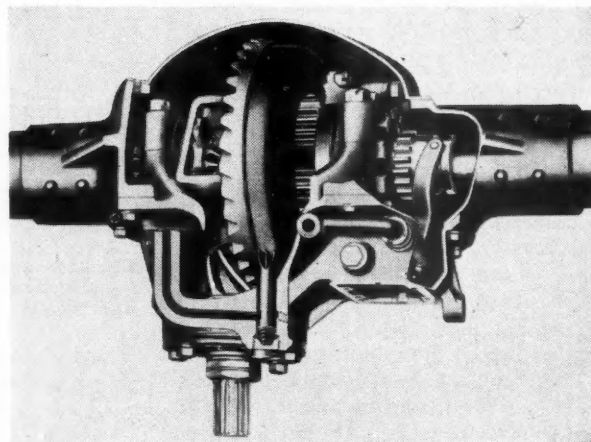
Two-speed-axle-equipped Ford V-8 trucks have been announced by the Ford Motor Co. The 157-in. and 134-in. wheelbase trucks will be offered with the special axle, as will the 191-in. wheelbase school bus chassis.

The new Ford two-speed rear axle has virtually the same basic design as the conventional Ford truck axle. The pinion shaft is straddle-mounted with two tapered roller bearings in front of the pinion and a straight roller bearing behind it. The differential case is supported on tapered roller bearings.

In the reduction only four additional moving parts are in operation, simple planetary system of gearing being used to obtain the reduction.

An internal gear (made integral with the ring gear), four smaller gears or pinions and a sliding gear clutch comprise the planetary system. Four idler pinions are mounted on pins of hardened bronze positioned in the inner case in which is mounted the conventional differential side gears, the differential spider, and four bevel pinions meshing with the differential side gears.

Forced lubrication to the bearings of the two-speed axle is provided by a revolving drum attached to the side of the ring gear, which raises the lubricant from the bottom of the



TWO - SPEED

rear axle now used on Ford V-8 134-in. and 157-in. wheelbase trucks. The Ford 191-in. wheelbase school bus chassis will also be equipped with this axle.

housing. At the top, a scraper tube bears with light spring pressure against the revolving drum and scrapes off the oil. The scraper tube is made with a division in the center. An opening on one side of this division connects with a passageway in the housing through which oil is delivered directly to the front pinion shaft bearings.

The opening on the other side of the division connects with another passageway which carries lubricant to the right-hand differential side bearing. From this bearing, lubricant flows through six openings into the gear case. Differential and planetary gears are constantly immersed in oil as they rotate, and lubricant is also supplied to the left-hand differential side bearing by rotation of the assembly.

New Nash Sales Area

Nash Motors Division of Nash-Kelvinator Corp. has established a sales area to be known as the Great Lakes Division and has appointed A. C. Tiedemann, former director of business management, as sales manager.

The new division, with headquarters in Detroit, includes Michigan, northern Ohio, the northernmost portion of Pennsylvania, and the western part of New York.

Assisting Mr. Tiedemann in the new Great Lakes Division will be C. B. Canavan and Julian Turner, sales promotion managers. J. E. Lamy, in charge of the Nash Motors Division's organization and analysis department in Detroit, will take over direction of the business management department.

Knudsen and Heacock Will Speak At Chamber of Commerce Annual

Four topflight personalities in the automotive and aircraft industries will take active part in the general sessions and round table conferences scheduled for the twenty-sixth annual meeting of the Chamber of Commerce of the United States which is to be held in Washington, D. C., May 2 to May 5.

Addresses will be made at general sessions by William S. Knudsen, president, General Motors Corp., and B. C. Heacock, president, Caterpillar Tractor Co. Mr. Knudsen's subject will be "Factors Affecting Employment," while Mr. Heacock has titled his message "Background for Expanding Business Activity." Round table luncheon conferences will include C. S. Ching, director, indus-

trial and public relations, United States Rubber Products, Inc., who will cover the subject of responsibilities of management and workers, and A. E. Raymond, vice-president, Douglas Aircraft Co., Inc., who will discuss the "requirements of expanding aviation as affected by future trends in commercial airplane design."

"What the Machine Has Done for Mankind," will be presented by Dr. James Thomas, president Chrysler Institute of Engineering, at a dinner meeting, May, 3.

Calendar of Coming Events

CONVENTIONS AND MEETINGS

Chamber of Commerce Meeting, Washington	May 2-5
American Foundrymen's Association, Foundry Show, Cleveland	May 14-19
National Battery Manufacturers' Association, Spring Convention, Cleveland	May 24-25
American Iron & Steel Institute Meeting, New York	May 26
SAE Summer Meeting, White Sulphur Springs, W. Va.	June 12-17
American Society for Testing Materials Meeting, Atlantic City, N. J.	June 27-July 1
National Petroleum Association Meeting, Atlantic City, N. J.	Sept. 14-16
American Welding Society Meeting, Detroit	Oct. 17-21
National Safety Council Meeting, Chicago	Nov. 14-18
American Petroleum Institute Meeting, Chicago	Nov. 14-18
National Industrial Traffic League Meeting, New York	Nov. 17-18
National Standard Parts Association Meeting, Chicago	Dec. 9-10

SHOWS

New York, National Motor Truck Show,	Nov. 9-15
New York, National Automobile Show,	Nov. 11-18
Pittsburgh, Pa., Automobile Show,	Nov. 11-18
Detroit, Mich., Automobile Show,	Nov. 11-19
Columbus, Ohio, Automobile Show,	Nov. 12-18
Buffalo, N. Y., Automobile Show,	Nov. 12-19
Chicago, Ill., Automobile Show,	Nov. 12-19
Milwaukee, Wis., Automobile Show,	Nov. 12-19
Minneapolis, Minn., Automobile Show,	Nov. 12-19
*Philadelphia, Pa., Automobile Show,	Nov. 12-19
*San Francisco, Calif., Automobile Show	Nov. 12-19
Los Angeles, Calif., Automobile Show,	Nov. 12-20
*Elmira, N. Y., Automobile Show,	Nov. 14-19
New Haven, Conn., Automobile Show,	Nov. 14-19
Baltimore, Md., Automobile Show,	Nov. 19-26
*Washington, D. C., Automobile Show,	Nov. 19-26
*Cincinnati, Ohio, Automobile Show,	Nov. 20-26
*St. Louis, Mo., Automobile Show,	Nov. 20-27
Newark, N. J., Automobile Show,	Nov. 26-Dec. 3
Denver, Colo., Automobile Show,	Dec. 5-10

*Tentative

Aluminum Cylinder Head Group Reports Results of Tests

The Aluminum Cylinder Head Committee which was organized several months ago, has reported that its work indicates that higher compressions made possible by aluminum cylinder heads and improved combustion chambers can reduce the cost per horsepower of automobile engines, in addition to improving performance throughout the range of driving speeds. As reported in *AUTOMOTIVE INDUSTRIES*, issue of Dec. 18, this work is being undertaken by the Advance Aluminum Castings Corp., Aluminum Co. of America, Aluminum Industries, Inc., Bohn Aluminum and Brass Corp., National Bronze and Aluminum Foundry Co., and the Permold Co.

A sample engine of typical manufacture in the lowest price field was used. Tests with the standard iron head, as well as with various types of aluminum cylinder heads on this engine, are said to have developed the fact that the commercial engine with iron head equipment developed 90 hp. With fuel of the same Octane Rating and a head incorporating a combustion chamber designed particularly for use with the aluminum head, it is claimed that the horsepower was increased to 104.

Crude Rubber Consumption Climbs 27.7 Per Cent

Consumption of crude rubber by manufacturers in the United States during the month of March, 1938, is estimated by the Rubber Manufacturers Association to be 30,487 long tons. Compared with 23,868 long tons consumed during February, 1938, this is an increase of 27.7 per cent, but 43.6 per cent under March a year ago. Consumption for March, 1937, was 54,064 long tons.

Gross imports of crude rubber for March are reported to be 35,967 long tons, a decrease of 18.1 per cent under the February figure of 43,930 long tons and 30.9 per cent under the 52,039 long tons imported in March, 1937.

Total domestic stocks of crude rubber on hand March 31 is estimated at 294,024 long tons.

Herbert E. Fenner

Herbert E. Fenner, service manager of the United American Bosch Corp., Springfield, Mass., succumbed to a sudden attack of illness on April 12. Mr. Fenner had been associated with the American-Bosch organization for more than 20 years.

Buick Control Laboratories Assure

By JOSEPH GESCHELIN

THE metallurgical organization of Buick Motor Division, General Motors Corp., at Flint, Mich., has been enabled to improve its effectiveness and increase the scope of its activities through the medium of the new control laboratories which have been in operation since the beginning of the year.

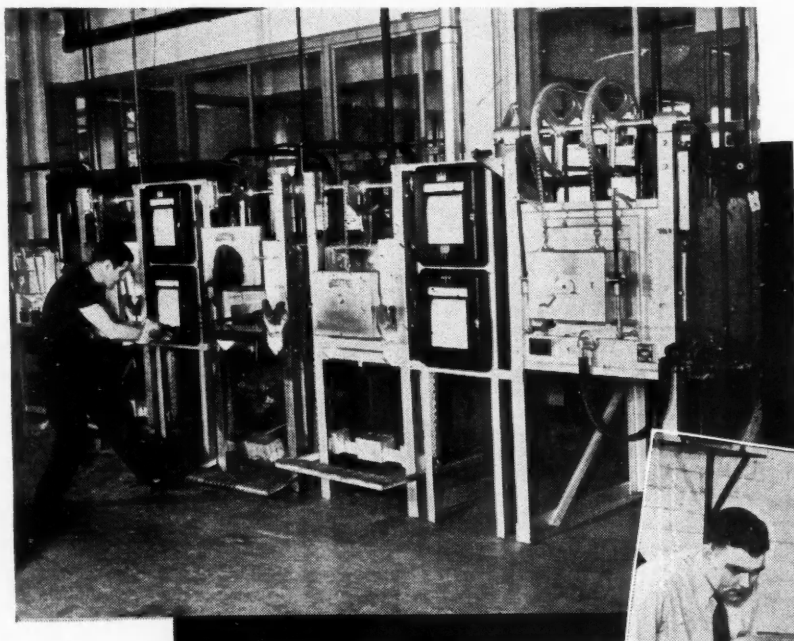
Under the direction of R. B. Schenck, chief metallurgist, Buick's

the direction of its supervisor issues all materials and process specifications originating from the laboratories. In this group is a contact man who works with the engineering department for the purpose of checking and approving specifications data which appear on the drawings.

2. Metallurgical Division—directed by the plant metallurgist, this department functions in each of the

four manufacturing plants—engine, transmission, axle, and forge shop—through contact men in each building. It is responsible for the inspection and sampling of all incoming raw materials; inspection and sampling of incoming finished products; and the final inspection of all heat-treated parts. By coordinating with the central laboratories, this division initiates much of the routine checking and control as well as development work on new materials and processes. Latest activity is assignment of a specialist to follow all welding developments and control methods.

3. Furnace Division—headed by the furnace engineer, this department controls the operation of all furnace equipment, studies new devices, and designs new equipment. In addition, there is a special detail for handling the maintenance and repair of all pyrometer equipment.

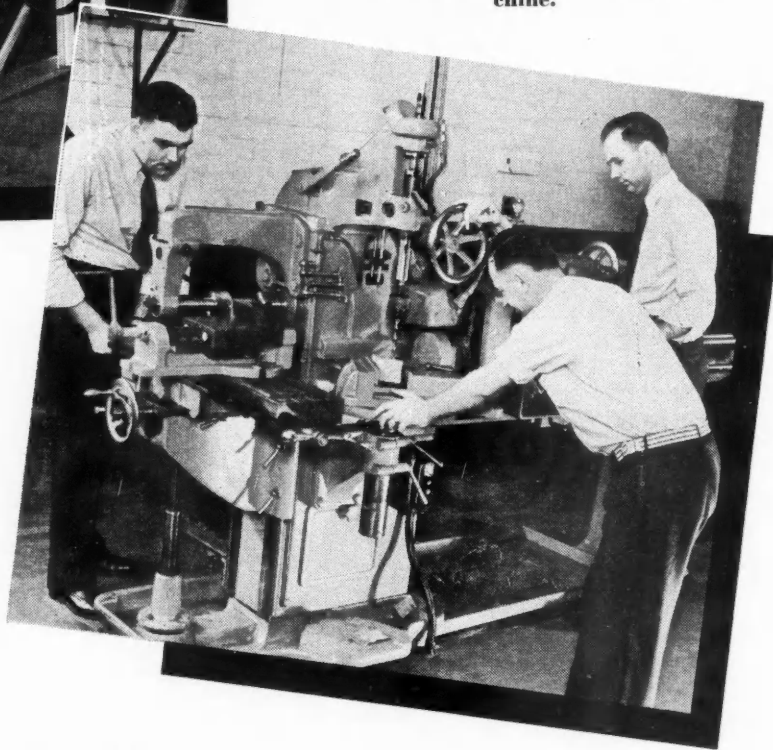


In the heat treat laboratories of the Buick metallurgical division at Flint are some of the most modern furnaces known to industrial metallurgy. View shows battery of electric furnaces.

set-up touches every phase of materials, heat treatment, and technical production process with any one or more of its five functional departments. Since even a brief outline of the responsibilities of each of the latter gives the perspective of an extraordinary control mechanism, we give below a brief high-spotting of each of the five branches:

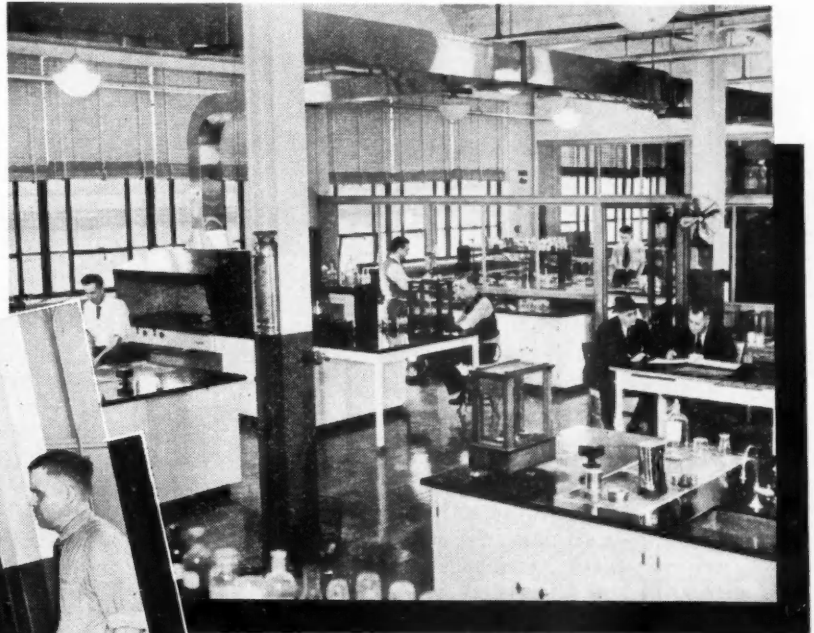
1. Specification Division—under

One of the unusual machines in the Buick metallurgical laboratories is this 4-in-1 Universal sampling machine.



Quality

This 60,000-pound Riehle hydraulic Tensile machine in the physical laboratories is set up for testing the strength of the butt weld on a Buick knee action A frame or lower control arm.



General view of chemical laboratory in Buick's new metallurgical division.

4. Physical Testing Division—this is a central laboratory activity under the direction of a supervisor. It is concerned with the gamut of physical testing as well as the operation of the metallographic equipment.

5. Chemical Division—a central laboratory activity under the direction of the chief chemist is concerned with all problems of chemical analysis, electro-chemical solutions, and the operation of salt spray tests on coatings of various kinds.

In general, the metallurgical set-up is charged with the responsibility of materials testing, materials development, and materials specifications as one aspect of its activity. Much

broader in implication, however, is its control activity providing a special inspection service, not only on incoming raw materials, but for all manufactured products in which heat treatment is involved.

The new central control laboratory is divided into logical functional departments which may be briefly described as follows:

1. Physical Test Room—equipped with various essential types of testing equipment such as—tensile and torsion testing machines, impact and Izod machines, hardness testers, and a microscope section with three Baush & Lomb laboratory photomicroscopic units, one of these being of the very latest type.

Among the equipment noted above, are three new hardness testers—one

Vickers and two Rockwell machines. Most noteworthy of the testing machines are the 300,000-lb. Riehle torsion testing machine and a new 60,000-lb. Riehle hydraulic tensile machine. The big torsion machine, said to be largest in this part of the country, is driven by an Oilgear hydraulic motor.

2. Chemical Department—featuring the very latest equipment for the purpose is divided into three general sections, a large routine chemical test room, miscellaneous chemical testing, and an oil laboratory. The exhaust system serving the various work benches operate through a network of ducts fashioned from gleaming stainless steel which is impervious to the attack of noxious fumes or gases.

3. Heat Treat Room—fitted with the very latest laboratory furnace equipment with individual Micro-max control, this department provides exceptional facilities for the development of new heat treatment techniques as well as for trouble shooting and control of production furnaces. Among the equipment in this department will be found—two Hayes electric furnaces, three Hoskins electric furnaces, two Hoskins furnaces for lead or salt bath treatment. (Turn to page 585, please)

Tractors and Industrial Power

By P. M. HELDT

A VERY successful two-day tractor meeting was staged at Milwaukee last week by the S.A.E. Tractor and Industrial Power Activity Committee, of which C. E. Frudden, Allis-Chalmers Manufacturing Co., is chairman, and John S. Erskine, International Harvester Co., vice-chairman. It comprised two technical sessions, two plant visits, and a dinner—a well-rounded program. The total registration was in the neighborhood of 300, and both technical sessions were well attended. Five bus loads of 35 each took part in the two factory visits, to the Milwaukee plant of the International Harvester Company and the plant of the Allis-Chalmers Manufacturing Co. in West Allis. Milwaukee naturally lends itself well to an event of this kind, for with two large tractor plants in the city itself, two more in nearby Racine, and more in Chicago, it is readily accessible to a large number of men in the tractor industry. A goodly part of the country's industrial-power-equipment industry also is domiciled on and near the western shore of lower Lake Michigan.

Deflection in Axles and Transmissions

E. G. Boden, experimental engineer of the Timken Roller Bearing Co., presented a paper on Deflection Tests of Axles and Transmissions. He described the testing machine originally built by Timken about 12 years ago, which has since been modified in various ways. Hundreds of tests have been made on this machine for customers.

The machine is driven by a 15-hp., 1200-r.p.m. induction motor, driving through two Brown & Lipe seven-speed transmissions, which provide a reduction ratio of approximately 100 to 1. The axle to be tested is placed on pedestals at the spring seats and bolted to the machine, which in turn is bolted to the floor. The regular axle wheels are replaced by gears of 14-in. p.d. and 4-in. face,

which mesh with similar gears on a solid cross-shaft of 3-in. diameter, supported by pedestals bolted to the machine base. On each end of the cross-shaft is mounted a 30-in. brake drum with 13-in. face, on which there is a prony brake having steel bands fitted with brake linings. A steel beam 10 ft. long forms a double brake arm and makes possible measurement of the torque with rotation in either direction, the distance between drum center and weighing scale being 5 ft. A torque of 10,000 lb.-ft. can be carried on each drum, while the input torque of the transmissions is limited to 3000 lb.-ft. by considerations of tooth loading.

To measure deflections of various parts of the axle when under load, dial indicators are located at these points, being mounted on brackets secured to the "third member of the axle between the two pinion bearings. A yoke is secured to the pinion housing by means of a number of staggered set screws. A bracket is carried from this yoke around the rear of the axle, on which the various indicators are mounted. In routine tests it is usual to check the pinion axial movement, pinion lift, pinion side movement, ring-gear axial movement, ring-gear lift, ring-gear fore-and-aft movement, differential-pedestal-and-cap movements, both vertical and in the ring-gear axis, and deflection of the pinion housing in relation to the carrier flange. In addition to making these deflection tests, records are taken of gear-tooth contacts. The tooth contacts under "no load" are first obtained by painting the teeth with powdered red-lead and oil, and the indicators are all set to zero. Four sets of indicator readings are usually taken, at 25, 50, 75 and 100 per cent of the maximum torque in low gear in both forward and reverse. This is done by tight-

ening the prony brake bands and weighing the torque reaction on standard platform scales. After the maximum torque has been applied, the load is removed and the deflections and tooth contacts are again noted, in order to see if any permanent set has occurred, due to some particular weakness. If such is found to be the case, investigations are made to determine the cause, and recommendations are made to improve the axle, so as to bring the deflections within limits found to be satisfactory in practice.

Gleason Works recommend that gear movements be not allowed to exceed the following: Along pinion axis, ± 0.003 in., pinion movement transverse to pinion axis and in line with ring-gear axis, ± 0.003 in.; transverse ring-gear movement, up-and-down or front-and-rear, ± 0.003 in.; movement of ring gear away from pinion, 0.010 in.

A common fault of rear axles is excessive lateral movement of the pinion housing relative to the left-hand pedestal leg and carrier flange under reverse loads. With hypoid gears the pressure angles on the coasting side are of the order of 25 deg., which results in high thrust loads. Fortunately, these reverse loads do not last long, as a rule, yet the utmost rigidity should be aimed at to allow for the inherent tendency to gear scuffing due to the increased tooth sliding while coasting or driving backward.

Another weakness of many driving axles is excessive deflection of the left-hand pedestal leg due to the separating force between pinion and gear. Substantial horizontal ribbing between the base of the pedestal legs and the pinion bearing, and stiffening of the pedestal legs to the carrier, avoids excessive leg spread. This is illustrated by the drawing reproduced herewith (Fig. 1). Some

Two days discussion of transmissions, valves, valve gears, cylinder finishes and liners, and dust house testing at the SAE tractor meeting

axles have external horizontal ribs *A* approximately in line with the top of the pedestal legs. The load on the left-hand pedestal leg is greater than that on the right because the ring gear usually is very close to the left-hand differential bearing. In order to reduce the bearing load on the left-hand bearing and provide sufficient stiffness for the ring-gear flange, many axles now have the pinion offset to the right.

With the more rigid housings, pads *B* are sometimes provided on the differential pedestal caps, which are machined to fit into the housing. These provide a bracing effect in the horizontal direction. Some axles have a pilot *C* turned on the pedestal caps to fit a machined diameter in the axle housing. This provides stiffness in the horizontal, and to some extent also in the vertical direction. For maximum stiffness in both directions, with cast housings without inspection plates, large size dowels should be fitted into the pedestal caps. Caps must be securely bolted to the pedestals. The usual method of fastening the caps is shown at *D*, the cap bolt having a clearance of $1/64$ to $1/32$ in. on the diameter. Greater rigidity can be provided by using a dowel-type stud as shown at *E*.

To ensure sufficient rigidity of the ring-gear mounting, the best practice is to back up the gear with a flange well ribbed to the differential bearing hub, as shown at *F*. Considerable trouble has been experienced with final-drive sets having reduction ratios of more than 6 to 1. The diameter of the pinion and its number of teeth are then usually made quite small (to limit the necessary diameter of the ring gear), which results in high tooth loading. The diameter of the shaft also is governed by the pinion size, and in many cases the shaft is further weakened by the gear cutters removing metal at the bearing supports. Under these conditions the deflection of the shaft becomes excessive, particularly with overhung mountings.

Discussion

Prepared discussion of Mr. Boden's paper was presented by L. A. Bixby of Clark Equipment Co., E. F. Brunner of Goodyear Tire & Rubber Co.,

J. L. Collins of New Process Gear Corporation, Louis Jacobi of Allis-Chalmers Manufacturing Co., B. W. Kesse of Wisconsin Axle Co., C. D. Peterson of Spicer Manufacturing Corp., and B. W. Van Zee, of Minneapolis-Moline Power Implement Co.

Mr. Bixby said parts will necessarily deflect under load, and the important point is to find out what is the limiting deflection that can be allowed and still have a product that is commercial in every sense. In transmissions, a great deal depends on the design of the case. It is not necessary to put in a lot of metal to obtain the necessary rigidity; the lines of force causing deflection should be studied, and the metal distributed so as to hold down the deflection to a minimum. Almost every engineer has had experience with some units, and the performance of these is a valuable guide when working on new designs.

Mr. Brunner reviewed developments in truck and bus practice con-

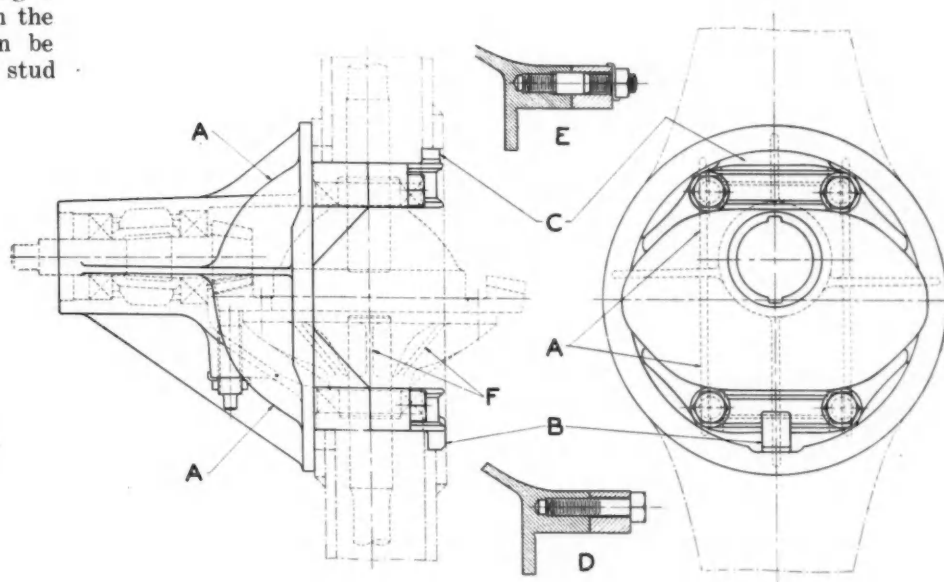


Fig. 1—Methods of stiffening rear-axle housing

sequent upon the introduction of pneumatic tires in these fields, and intimated that similar improvements in operating results might be expected from the use of rubber tires on farm tractors. Pneumatic tires for tractors are inflated to only 12 to 20 lb. per sq. in., and therefore have much greater cushioning power than the bus and truck tires with their higher pressures. He expressed the belief that a tractor designed for operation on rubber tires only, in one of the popular sizes, could be produced at a lower price to the owner, including tires, than the present-day tractor with its steel wheels. At present the cost of rubber tires adds very materially to the cost of the complete unit, and the implication seemed to be that if a tractor were designed for use with rubber tires only, it could be built sufficiently lighter so that the saving on materials and machining cost would make up for the difference in the costs of rubber-shod and steel wheels.

Mr. Collins said the important problem that confronts the engineer when gears show insufficient life, is to find out just where the fault lies. Stiff shafts are essential, and a certain minimum rigidity is required to obtain satisfactory life. In one case an increase of 1/16 in. in the shaft diameter gave 50 per cent greater gear life.

Mr. Jacobi agreed with the author of the paper that it is sometimes most economical to make certain parts so they will have only enough life expectancy that they must be renewed once or twice during the life of the machine, but he said this did not apply to transmission gears. To reduce the deflections in transmissions, the designer should adhere to such fundamental rules as the following: Make bearing spreads a minimum; keep overhanging loads close to the bearings; place gears where they will cause the least deflection; use adequate bearings and support them solidly; avoid flat walls; in the case of cast-iron housings, favor fibers under tension. If these rules are followed, the designer need not worry much about the outcome. He also spoke on some problems that arose in the design of an A-C 10,000 hp. gas engine with a cylinder bore of 60 and a stroke of 68 in. The double-acting piston weighs 6000 lb. and floats on a piston rod 25 ft. long that weighs 18,000 lb., and to prevent abnormal wear of the stuffing-box packing due to deflection of the rod by the weight of the piston, the rod was so ma-

chined that it is straight when under the weight of the piston.

Mr. Keese said there has been a constant tendency to increase input torque without increasing the strength of the driving members correspondingly. When gears show inadequate life, the usual thing to do is to increase face widths or change to a coarser pitch, but frequently this does not get at the root of the trouble. What good (he asked) is a 3 in. gear face when there is tooth contact only over 1/2 in. of face? Gear-cutting practice now holds involute forms to 0.0003 in. and helix angles and spacings to 0.0003 in. without exorbitant cost, but excessive deflection often creeps in and destroys the results. In speaking of deflection, we generally think first of shafts, but deflections may be caused also by insufficient stiffness in the housing, and by too large clearances in the bearing seats or in the bearings, and all of these factors should be checked. While certain deflections can be calculated, it is impossible to calculate their results on the gear teeth, and it is usually necessary to examine the unit and test it with blueing on the teeth and in the race ways, and study the true results of the deflection—whether it favors the design, as is sometimes the case, or is harmful, as is much more frequent. Mr. Keese suggested that when the deflection tests described by Mr. Bode were made, the torque applied be increased to 125 or 150 per cent of the normal full-load torque. He said changes in design making the shafts and housings more rigid sometimes actually cut

the cost of the whole unit, by making it possible to use smaller gears and bearings.

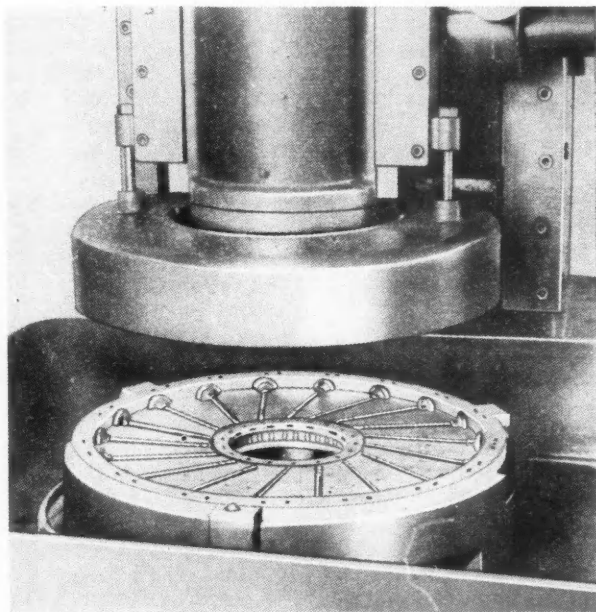
Valves and Valve Gears

It appeared from the paper on Valves and Valve Gears, by A. T. Colwell, vice-president of engineering, Thompson Products, Inc., that the aircraft-engine industry has been doing pioneer work in increasing valve life, by resorting to advanced technical but somewhat expensive methods. Some of the newer installations have been operating satisfactorily for 5000 hours, and their ultimate life is as yet undetermined. This notwithstanding the fact that the power output is from 60 to 120 hp. per exhaust valve. The factors which received individual attention in this development work were materials, clearances, lubrication, alignment, and surface finish.

Austenitic steel is used for the exhaust valves, which latter work in bronze guides. Lubricant is metered to the rocker boxes through the rocker arms. In one case the valve stems are nitrided. Exhaust guides do not project above the boss. Seating portions of the Stellite-faced valves are given a mirror finish, and the stems are honed. Seat inserts are of TPA steel. Tips of impact-resisting steel are welded on, and the rocker arm is provided with either a ball or a roller. Rocker arms are so arranged that they are at right angles to the valve-stem axis at half lift. Cylinder heads are designed to prevent serious distortion of the valve seat. One design of sodium-

(Turn to page 581, please)

Fig. 2—Honing valve stems in Foster honing machine



Just Among Ourselves

Between You and the White House

ON April 14, during his first "fireside chat" in five months, President Roosevelt singled out the automobile industry for some unwelcome attention. Early in 1937, according to the President, there came into the economic picture "certain highly undesirable practices which were in large part responsible for the economic decline which began in the later months of the year . . . production outran the ability to buy."

" . . . for example, through the winter and spring of 1937 cotton factories in hundreds of cases were running on a three-shift basis, piling up cotton goods in the factory and in the hands of middlemen and retailers.

"For example, also, automobile manufacturers not only turned out a normal increase of finished cars but encouraged the normal increases to run into abnormal figures, using every known method to push their sales. This meant, of course, that the steel mills of the nation ran on a 24-hour basis, and the tire companies and cotton factories speeded up to meet the same type of abnormally stimulated demand. The buying power of the nation lagged behind."

In the words of another great Democrat: "let's look at the record."

First of all, let us remember two things. Holding automobile shows in the Autumn instead of during January, was an idea sanctified from the White House, and accepted by the automobile manufacturers, who may be presumed to be a little more realistic about possibilities in their own industry than an outsider could be. Second thing to remember is that perfect accord between automobile or any other group of manufacturers on matters involving competition is surrounded by enough legislative restrictions to fill a truck load of statute books.

And while we're on the subject, we might mention another minor difficulty affecting the conduct of the automobile industry during 1937. The labor situation was of a character to encourage manufacturers to accumulate car-inventory in foresighted provision against a time when it might be necessary to close plants for a protracted period.

These things are offered as background which might have tended to bring about such conditions of overproduction, but which, in the light of the figures available, did not.

For the first six months of 1937 U. S. production of passenger cars exceeded domestic sales and U. S. exports each month, so that by the end of June the apparent cumulative addi-

tions to dealer stocks totaled about 245,000 units.

Beginning with July, domestic sales and exports exceeded production each month through September to the extent that cumulative additions to dealer stocks were reduced to about 81,000 units by the end of September.

In other words, for three months prior to the automobile show period chosen by Mr. Roosevelt himself, the industry made definite and successful efforts to reduce drastically stocks of 1937 cars in the hands of dealers.

October was the month of the National Automobile Show. By the end of that month production again exceeded domestic sales and exports to the extent of adding about 60,000 units to dealer stocks. This brought the total dealer stocks to somewhere around 2 cars per dealer, national average. Surely this is not an exorbitant figure!

For the next two months stocks did rise sharply, so that the visible addition reached a cumulative total of about 300,000 units. This figure included, of course, cars in the hands of factories, warehouse and dealer—let's call it 10 per cent of the presumptive production for the year.

The danger signals were heeded. In January sales and exports outran production by more than 8,000 units—and this in an industry which had constantly drummed into its collective ear the necessity of maintaining employment and wages at a high level for the good of the country; an industry which had every right, in the light of past experience, to expect a sharp seasonal Spring upturn which failed to materialize.

Finally, it's an industry which, if it can be said to be overproduced, is overproduced for three months after the beginning of the present recession, and which, therefore, did not contribute to its beginning. It's an industry which was big enough to spend several million dollars in a coordinated attempt to blast loose the used-car market for the good of itself and other industry.

It's an industry to which an inventory of 300,000 cars does not represent overproduction, when its liquidation is a matter of weeks.

If the industry had had 300,000 cars on hand last September—that would have been overproduction.

If the industry were to have 300,000 cars of 1938 models on hand at the end of this September—that would be overproduction.

But it didn't, and it won't.

That's the record.—HERBERT HOSKING.

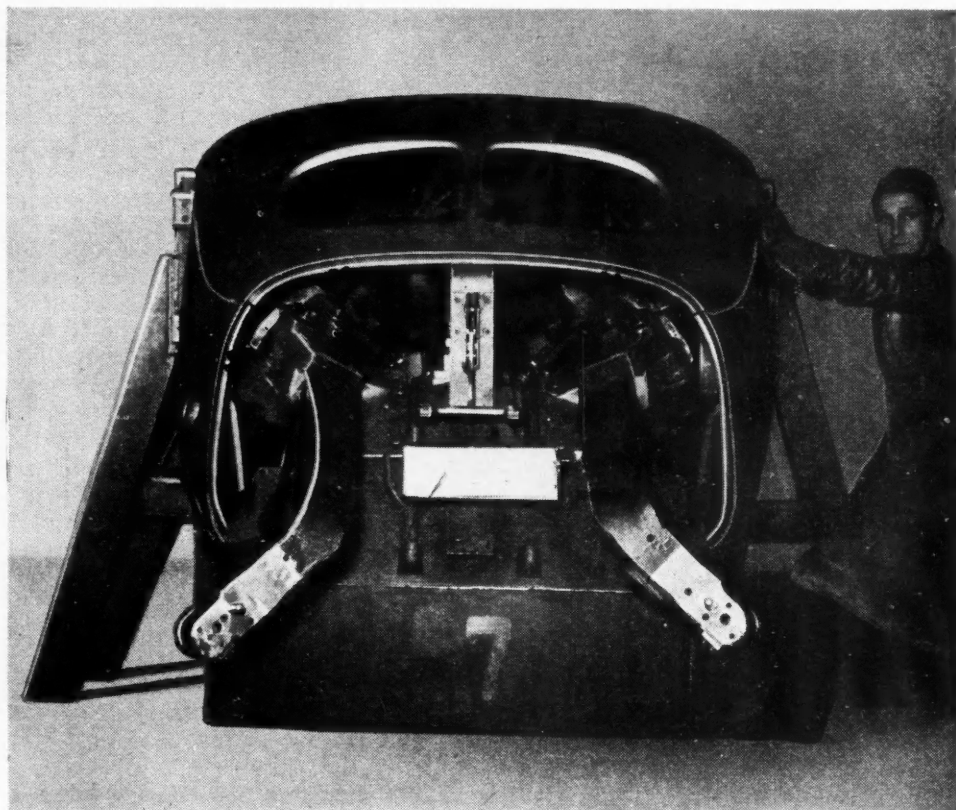


Fig. 1—Fabricating bodies at Hudson Motor Car Co., Detroit, by a new method utilizing electric welding.

Butt Welding on Bodies

SUBSTANTIAL savings in the cost of body fabrication have been achieved at Hudson Motor Car Co., Detroit, by the use of a new method of assembly by butt welding, said to provide stronger construction, free from leaks, squeaks, and distortion, and complete elimination of metal finishing which is frequently necessary with conventional methods.

One of the most important developments in many years, the new method was worked out by Hudson engineers in an effort to simplify body fabrication, and to reduce, if not completely eliminate, the hazards and expense of soldering. Although disclosed for the first time, the process has actually been in use for three years in the construction of Hudson bodies.

At Hudson, the panels are joined by plain butt welding by the elec-

tric arc process in which the edges of the panels are brought together in a jig and fused with a single pass of the arc welding electrode. Because there is full and complete

penetration of the weld metal through the joint, the need for finish-soldering is virtually eliminated, with consequently important savings in solder cost per body.



Fig. 2—Roof panel and rear quarter panel being electrically welded in jig at Hudson automobile factory in Detroit.

The finished joint is practically flush with the adjoining surfaces.

The fabrication of a body, utilizing plain electric butt welds in the Hudson factory, is shown in accompanying illustrations. The procedure consists of placing the roof panel and the two rear quarter panels in a specially designed jig (see Fig. 1), which clamps the panels in place with edges butted together and which, by means of two arms, provides copper back-ups for the welding (see Fig. 2). The joint welded on both sides of the body extends from a point adjacent to the rear window to the corner of the trunk opening. The two joints

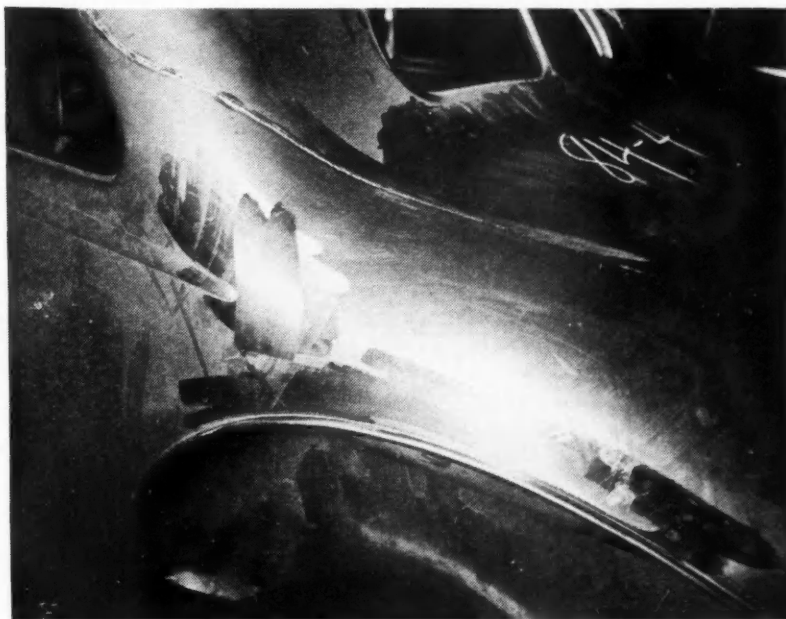


Fig. 3—Finished 36-inch electric weld on a Hudson coupe body.

Cuts Costs at Hudson Plant

are approximately 18 inches long in the case of the sedan, and approximately 36 inches long in the case of the coupe (see Fig. 3).

With the panels clamped in the jigs, with the butting edges backed up by copper, two arc welding operators start simultaneously on either side. The welding is done from the inside, each operator starting at a point near the rear window and progressing toward the rear deck opening. The welding electrode used is "Lightweld," manufactured especially for arc welding thin-gage materials by the Lincoln Electric Co., Cleveland, Ohio. The 18-inch weld is made with approximately $1\frac{1}{2}$ and the 36-inch weld with approximately three $\frac{3}{32}$ -inch electrodes. The weld metal produced is equal to the parent metal in physical properties.

According to Hudson officials, this method provides precision fit-up of doors and deck lids and trunk, and eliminates pin holes and pop-outs which frequently appear during the painting operation due to heat which causes the metal to raise under the solder. While sim-

plifying the welding, the new method also minimizes forming operations. Since the edges of the panels are simply butted together for welding, there is no need of

offsetting as in the case of the conventional depressed or lap joint. No difficulty is experienced in holding the trim line to a tolerance of $\frac{1}{32}$ -inch.

Britain Urged to Develop Aircraft Diesel

A Committee of Inquiry appointed last November to look into charges of inefficiency made against the British Air Ministry has just made its report. On the subject of aircraft engines the report states that the position of the British industry in the production of gasoline-type aircraft engines is fairly satisfactory. It is pointed out, however, that if British civil engines are to hold their own with foreign makes, constructors should see that the requirements peculiar to civil aviation, such as high power at take-off, are studied and met. Although recent advances in petrol-engine design and the use of high-octane fuel have given the petrol engine a definite lead over the compression-ignition engine for military purposes, the Committee con-

sider that the development of the latter type should be actively pursued with a view to its eventual use in large civil flying boats and in land aeroplanes intended for operation over long distances. They therefore suggest that development grants should be made from the Air Ministry with the object of producing within the next five years a compression-ignition engine representing a considerable advance on any non-British engine of this type now on the market. The comment of the Government on this point was that the State had already contributed large sums of money in assisting the development of compression-ignition engines, but they agreed that assistance should continue to be given for this purpose.

CULMINATING over three years of development, announcement is made of a new electrically-operated fuel pump produced by the King-Seeley Corp., Ann Arbor, Mich. It is made in one standard size, and being essentially of pusher type is recommended for installation at the gas tank, where it is in the most favorable location with respect to elimination of vapor lock. The standard unit has a delivery capacity of 40 gallons per hour free flow, 20 gallons per hour being about the normal range under average operating conditions.

Due to this great pumping capacity, the standard unit can be readily applied on any automotive apparatus, including passenger car, motor trucks, industrial power units, stationary engines, buses, etc. The maximum running pressure is only $2\frac{1}{2}$ lb. per sq. in., idling. Current draw is about 2 amperes at 10 gallons per hour, and a maximum of under $2\frac{1}{4}$ amp. at 30 gal. per hr. Repeated tests indicate that the pump will start at a voltage just a little above 3.

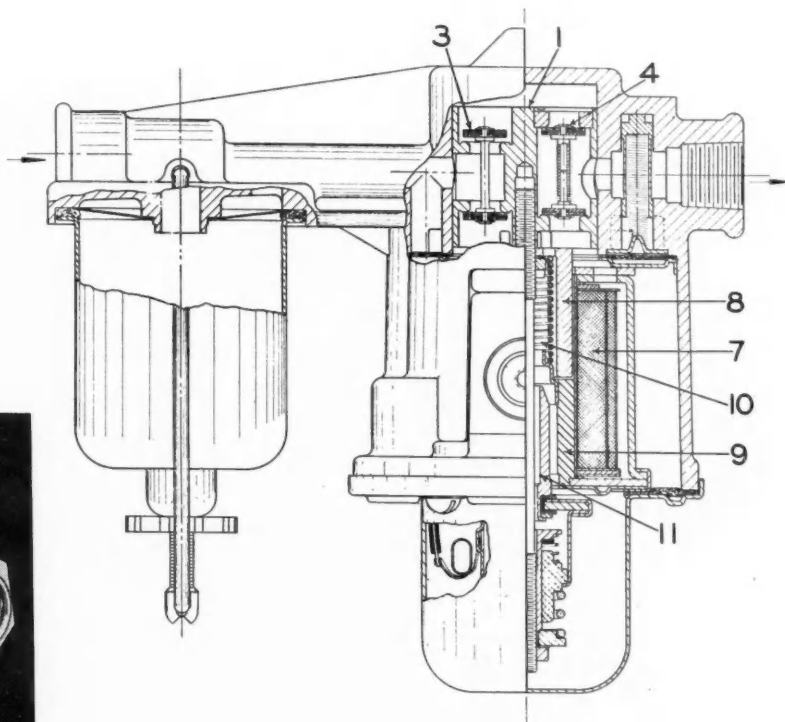
It is of interest to note that this unit has been tested and approved by the Underwriters' Laboratories, giving assurance that there is no fire hazard resulting from the constant operation of the contact mechanism. Contact areas are large,

contact is broken sharply, and the entire contact mechanism is immersed in gasoline to further assure quenching of any spark.

In detail, the K-S pump combines a fuel bowl and strainer element at one end, and the pumping mechanism at the other end. Pumping action is accomplished by means of a piston with two balanced and automatically-acting valves, reciprocated by solenoid action. Under operating conditions the pump is always in action. However, at idling, when the maximum pressure

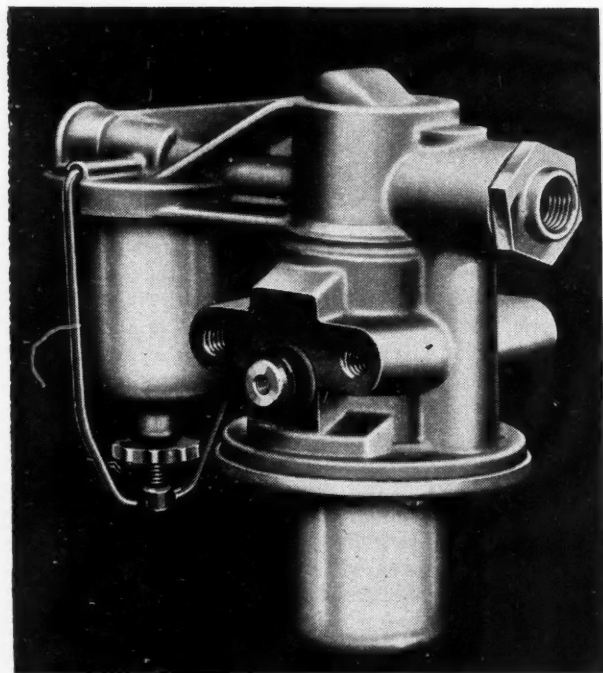
of around $2\frac{1}{2}$ lb. is reached, the fuel is circulated within the pump through a by-pass, so that no further pressure rise is built up in the fuel system.

The principle of operation will be described by reference to the sectional drawing. The body proper is a zinc alloy die casting, while piston 1 is of die-cast aluminum, diamond turned. The cylinder is diamond-bored, a clearance of about 0.003 in. being provided between piston and cylinder wall. In the position shown, the piston is at one



Cross-section and photographic view of the King-Seeley fuel pump

end of its stroke, and fuel has been drawn into the upper chamber through the upper end of inlet valve 3. At the same time, fuel in the lower chamber is forced through the lower end of outlet valve 4 through an opening in the side of the piston, and out to the delivery line. On the reverse stroke of the piston, the valve action is reversed, fuel being drawn in through the lower end of



Fuel Pump

*is announced by the King-Seeley Corp.
after three years of development*

the inlet valve and forced into the delivery line through the upper end of the outlet valve. Thus valve action is automatic without the use of springs. The outlet valve does have a light spring, but this comes into play only in priming, when the pump is bone dry, as at initial assembly.

We may now consider the action of the power mechanism. The piston is pulled down when the solenoid 7 is energized, drawing down the movable iron core 8 toward the fixed iron core 9. When the elec-

trical circuit is broken, the power spring 10 returns the piston to the top position.

The contacting mechanism, the very heart of the pump, has been given particular attention to assure positive and dependable action. How this has been accomplished may be appreciated by considering the following points:

1. Contact plates are of stainless steel of large area, the diameter of the contacting surface being about one inch.

2. The circuit is made and broken

in a bath of gasoline which aids in quenching the spark.

3. Breaking action of contact points is quick and positive, due to the action of the contact spring.

4. Magnetic action of the solenoid on the core 11, attached to the lower contact, provides a tight contact at the breaker points at the instant of contacting.

5. To assure free action of the contact mechanism, the Bakelite bushing which supports it is a comparatively loose fit on the rod. If any dirt trapped in the fuel gets between the contacts the bushing will rock by spring pressure and make contact at another point.

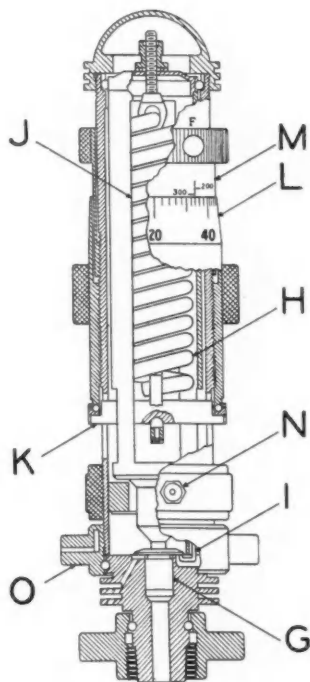
Pumping action is practically independent of temperature, the pump having been tested through a complete range of temperatures from below zero to 160 deg. Fahr. It is claimed that the pumping action is more powerful at low temperatures, for while the battery power may be low, the electrical resistance of the circuits also is decreased.

Pressure Indicator Has Automatic Correction Feature

A NEW type of pressure indicator, developed by the Bacharach Industrial Instrument Co. of Pittsburgh, is claimed to represent an important improvement over similar instruments of earlier design. The principal novel feature is a simple adjustment which automatically corrects the readings for the inertia of moving parts and permits accurate readings of compression and combustion pressures at any engine speed and any rate of pressure rise.

The essential parts of the indicator are a piston *G* exposed to the engine pressure, a helical tension spring *H* against which the piston acts and the tension of which is adjustable, and a neon-light circuit with a contact switch *I* operated by the piston so as to indicate any movement of the latter.

Every time the cylinder pressure exceeds the pressure at which the instrument is set, the flasher gives an instantaneous visual glow. The spring tension is then gradually increased by turning the index sleeve clockwise until the flashes disappear, which indicates that the spring ten-



Details of the Bacharach pressure indicator

sion is just sufficient to stop the piston movement. The indicator is then in correct adjustment and the maximum cylinder pressure is indicated directly in lb. per sq. in. on the scales on the index sleeve *L* and the scale sleeve *M*. The scale on the index sleeve is graduated in fifty divisions, each division representing 2 lb./sq. in. The index sleeve advances during one revolution a distance equal to one division of the vertical scale on the scale sleeve, each division of the vertical scale representing 100 lb. per sq. in.

Before the measurement is made, the scale sleeve *M* is turned until the red circular mark on the vulcanite ring is in register with "C" when the compression is measured, and with "F" when firing pressures are read. This adjustment automatically corrects the readings for inertia of the moving parts.

The piston is readily accessible for inspection and cleaning by unscrewing the wing nut union *O*. The union is provided for water cooling to keep the indicator cool during long periods of continuous use for measuring

(Turn to page 585, please)



Two-ten thousandths of an inch, is the tolerance on diamond-boring the wrist pin hole in pistons for the Plymouth Roadking.

Production Lines

ments" and "instrumentation," occasionally used almost interchangeably. An instrument is, of course, purely the single piece of equipment whether it be a meter or optical system or any other attachment. Instrumentation on the other hand, is a broader concept envisaging a complete set-up of devices of all kinds, implying the application of engineering and physical knowledge in the solution of a specific and unique problem.

Light Control

Understand that a small independent organization, Photoswitch, in Cambridge has developed an interesting line of photocell controls for industrial applications. Their equipment has worked out so well in New England plants that they are planning to do some work in the Motor City pretty soon.

screw occurs at the face of the nut. By relieving the nut at the bottom thread portion, stress is distributed over more if not all of the threads. If the nut has capacity to yield elastically, then the entire load is distributed over all of the threads. Interesting is the fact we have learned since that a widely used proprietary nut combines the essential features mentioned above. Its proponents have never had the benefit of proving their claims by photoelastic means.

Advanced Doings

Most profitable visit in a long time was our trip to the Caterpillar plant in Peoria. Did you know that they found it necessary to set up a special department for the manufacture of all piston rings required for the line of Diesel engines—we didn't. When you consider that 90 per cent of current Caterpillar production is Diesel engines, the piston ring business is quite sizable.

Surface Quality

Much discussion now concerned with accepted methods of rating machined surfaces for roughness or quality of finish. Although it's quite premature to mention this at the moment, it is interesting to learn that Zeiss is working on an optical device which is expected to rate surface finish by means of a novel system using the principle of the interferometer. We'll probably have to wait a year for further news.

Stress Analysis

Role of physical science in providing proof of what actually happens in mechanical elements was admirably shown by O. J. Horger, Timken bearing research engineer in his paper on photoelastic studies at the recent AIP symposium at Ann Arbor. One of his demonstrations was a study of screw fastenings. He showed by stress distribution diagrams that, in the conventional screw thread only the first two threads carry the entire load and, further, that fatigue failure of the

Only Holes

An aggressive organization in Detroit has founded a business concerned exclusively with specialization in the production of quality holes. Precision requirements today demand special attention to hole production, tooling, and gaging. These people are equipped to do the job for you in the best accepted manner. Rather interesting the things that people can specialize in.

Expert Welding

On occasion we have noted how welding of every type is fast assuming the stature of one of the most important of production processes. Confirmation is forthcoming in the metallurgical set-up at Buick where an expert attached to the staff of the plant metallurgist has been assigned the responsibility of following all developments in welding, standardizing production techniques and developing controls.

Needs Definition

There are times when precise definition of terms is an aid to understanding. That was a real service rendered by Dr. E. J. Martin of G. M. Research at the recent meeting of the American Institute of Physics at the U. of M. In discussing instruments used in modern investigations, he pointed to the difference in concept as between the terms "instruments" and "instru-

Engine Bearing

One of the most important of the bearing manufacturers tells us confidentially that they have just placed in service a new production line for a unique engine bearing. We don't know the details but suspect it has something to do with powder metallurgy. If we're prodded, we may be able to find out.—J. G.

Vacuum-Automatic Distributor for Twelve-Cylinder Engines

DELCO-REMY has developed a vacuum-automatic distributor of the heavy-duty type for use on twelve-cylinder coach engines. To fire twelve cylinders by means of a single coil, exceptionally fast breaker action is required. A 12-lobed breaker cam is used and acts on two breaker arms, referred to as the "stationary" and "movable" breaker arms respectively. The primary circuit is opened by the stationary breaker arm, and it is the breaking of the stationary contacts that produces the ignition spark. Owing to the fact that twelve sparks have to be produced per revolution of the timing shaft (six per revolution of the crankshaft), the cycle period of the breaker arm is very short and at high speeds the duration of contact of each breaker arm would be hardly sufficient to properly build up the magnetic field of the spark coil, so that with a single breaker arm the spark might be of insufficient intensity to cause ignition. To prevent this, the second breaker arm is introduced. The latter closes the circuit 5 deg. of cam motion before it is closed by the stationary breaker arm, so that the circuit remains closed 5 deg. of cam motion longer than it would with a single breaker arm.

The distributor cap has side outlets for the high-tension wires. It is so designed that it is impossible for moisture to collect between the high-tension wires and cause cross-firing. Furthermore, it will permit



Delco-Remy double-lever
ignition unit for 12-
cylinder engines

water to drain off readily and allow the wiring and surfaces of the cap to dry rapidly.

The high-tension wires are assembled in tight-fitting rubber nipples. They are cut off square and assembled the full depth of the nipple. When the wire and nipple are being assembled to the cap, each wire should be pierced by the needle point above the insert. The flat surfaces of the nipples should fit squarely to the inside flat surfaces of the top part of the cap and inserts. To pre-

vent injury to the hand, the needle points should be pressed through the nipples with a soft wooden block. When using the fingers to press them down, there is also the possibility of the nipples on the wires not being assembled squarely over the needle points. The rotor is of the single-spark type and is anchored to the circuit-breaker cam by a semi-circular locking spring. When the rotor is being assembled, the spring "ratchets" into an undercut on the cam. The spring should be in place when the rotor is being pushed into place on the cam.

The circuit-breaker plate assembly is movable. It is integral with the outer race of a double-row ball bearing at the center, and it is not supported by the distributor housing. The plate supports two sets of contacts, one stationary, the other movable. Rotation of the breaker cam is clockwise, looked at from the drive end. The contact points open 0.015 in. The contact spring has a tension of 19 to 23 oz. The spark occurs when the stationary contact points open. The adjustable contact points should be adjusted so that they will break 5 cam deg. or 10 crankshaft deg. before the stationary contacts open. Each pair of contact points remains closed 16 cam deg., but with the 5 cam deg. overlapping of the closed periods of the two pairs of contact points, the total period during which the circuit remains closed will be 21 cam deg. This leaves 9 deg. for the period during which the

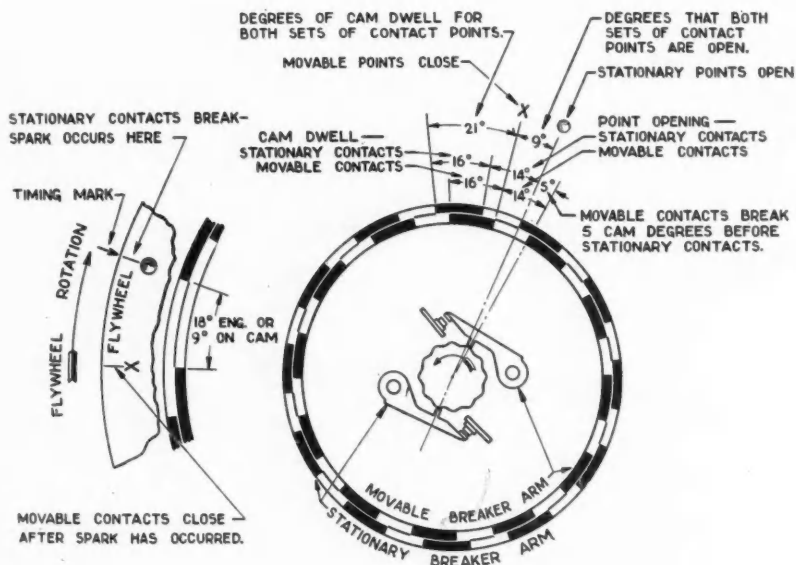


Diagram showing periods of open circuit (white) and closed circuit (black) for the two breaker arms

circuit is open. A shorter "open-circuit" period than 9 cam deg. may result in rapid deterioration of the contact points.

After the contacts have been adjusted, the rotor tip should be aligned with the cap inserts. The back or trailing edge of the rotor tip should be slightly past the approaching edge of the cap insert when the stationary contacts are just opening and the vacuum unit is in the full-retard position. There are two marks on the rim of the distributor cap, $5/16$ -in. apart. This is the width of the rotor tip, and both edges of the tip should be aligned with the marks. The first mark on the rim is $1\ 25/32$ in. from the edge of the cap-locating pin in the clockwise direction (chord measurement). The connector bearing should be located so that the stationary contacts break when the edges of the rotor are properly aligned. It is in a slot in the plate, so that the plate assembly can be shifted to obtain the proper relation between the contact-point break and the rotor position. It is recommended that a timing light be used in noting the break of the stationary contacts.

The flywheel is marked so that the total time both sets of points are open can be obtained with the distributor on the engine. There are two marks on the flywheel, a ball and an X. When the stationary points open, on the ball mark, the spark occurs. The movable points are adjusted to close on the X mark. Both sets of contacts should be checked again for point opening, which

should be 0.015 in.

In the distributor cup below the circuit breaker plate are located the governor weights and springs. As the speed of the engine increases, the weights move outwardly, thereby moving the breaker cam in the direction of distributor-shaft rotation. The movement of the governor weights is controlled by calibrated springs. A top or cover plate holds the automatic cam and governor weights in proper alignment at all times. The automatic spark curve is designed to suit wide-open-throttle operation of the engine. The spark starts to advance at 400 r.p.m. and reaches a maximum of 22 crankshaft deg. at 2800 r.p.m. The low limit for the spark advance is 4 crankshaft

deg. less than each corresponding value given.

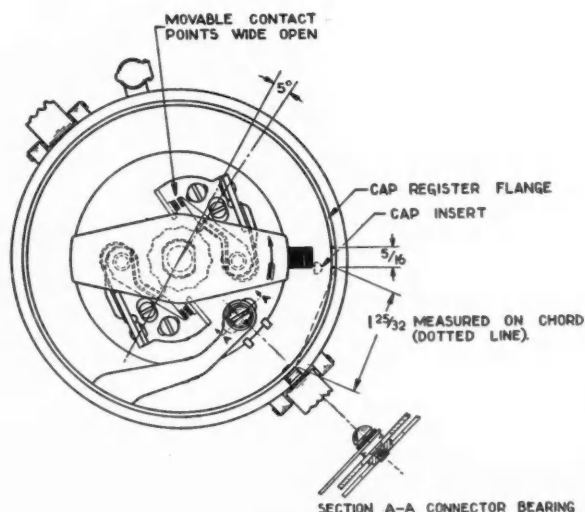
The vacuum control unit is linked to the circuit breaker plate, the link attaching to a connector bearing in the slot in the circuit-breaker plate. The vacuum unit advances the spark only during part-throttle operation. The vacuum line is tapped into the carburetor at the throttle valve, and when the throttle is closed the vacuum opening is on the carburetor side of the valve. The maximum spark advance due to vacuum is 10 crankshaft deg., accomplished by the vacuum diaphragm shifting the movable circuit breaker plate. Vacuum advance starts when the vacuum attains 3-5 in. of mercury, and reaches its maximum at 10-15 in. of mercury. There is no vacuum spark advance under wide-open throttle, as the vacuum is then insufficient.

The condenser, which is mounted on the outside of the distributor housing, is of the heavy-duty type. It is sealed against moisture and will function satisfactorily at high temperatures. It has a capacity of 0.28-0.32 microfarads.

W. R. Edson

After an illness of several months, William Russell Edson, vice-president of Mack Trucks, Inc., died on April 14. Mr. Edson had been associated with Mack Trucks, Inc., since the inception of the present corporation in 1911. In his 27 years in the company's service he filled a number of executive positions and took an active part in the management. During the last five years he had direct charge of the company's sales organization in both domestic and foreign fields.

This diagram shows the position of the rotor with relation to the cap insert at the moment the stationary contact points open



TRACTORS and INDUSTRIAL POWER

(Continued from page 572)

cooled valve with nitrided stem of 0.682 in. outside diameter, installed with a minimum clearance of 0.0035 in., often shows a stem wear of only 0.001 in. after 3000 to 4000 hours, and the wear during this period seldom exceeds 0.004 in. Guides are guaranteed to have a life of 1000 hours, or about 180,000 air miles, and they usually last 1200 to 1400 hours.

In the tractor field, valves and valve guides often wear at an alarming rate, and Mr. Colwell voiced the opinion that this wear is responsible for many troubles for which other parts are blamed. The author took up the various factors affecting valve life in regular order and pointed out means of reducing the rate of wear as controlled by each of these factors. To reduce the wear on valve stems and in guides, a high-grade surface finish is essential. Valve stems, tappet faces, and similar parts are now being finished on a new type honing machine developed by the Chrysler Corp. in collaboration with the Foster Machine Co. of Elkhart, Ind. As shown in Fig. 2, a number of valves are placed tangentially on a horizontal wheel, this wheel being rotated with the valves, and the upper wheel is given both a circular and an oscillating motion in the direction of the valve stems, whereby an excellent finish is produced that reduces initial wear in the valve guides. This process, moreover, obviates the need for a special inspection after the grinding operation, as inaccurate grinding immediately becomes evident when honing. On valve stems this machine, using either a Norton or Bay-State honing stone of 500 grit, has a capacity of 1000 valves per hour, and gives a surface finish yielding Profilometer readings of 2 to 4 micro-inches.

How important a factor the valve-stem clearance is was brought out by tests conducted by Harry Smith of Buick Motor Co., who found that for each additional 0.001 in. initial clearance, the wear in 10,000 miles was approximately 0.002 in. greater. Minimum clearance within the permissible limit has the further advantages that it facilitates heat transfer to the block, prevents block pounding, valve breakage, and guide wear, and improves the seating of the valve. It also minimizes oil- and

air-pumping through the inlet guide. As means of obtaining good surface finishes on the valve stem and in the guide, Mr. Colwell recommends the following:

Valve stems should be smooth-ground or honed, and guides preferably should be broached and sized, care being taken that the part is not bowed in the operation. The guide should be in perfect alignment with the valve seat in the block. It should be well seated in the block, as this promotes heat flow and results in a cooler valve stem, thus preventing scuffing and seizure. Sweeping passages with the boss high in the passage (Fig. 3) are best. Copper-plating the valve stem 0.0002 in. permits of a smaller initial clearance and reduces the initial wear, the copper acting as a lubricant during the wearing-in period, and filling depres-

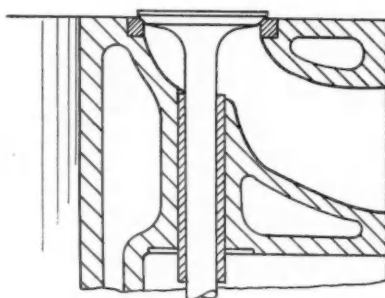


Fig. 3—Design of valve passage referred to in the Colwell paper

sions. In one case the initial clearance was reduced from 0.0045 to 0.0025 in. with copper-plating, and the rate of wear was reduced. Chromium-plating of valve stems has been advocated by the Navy, and Lieut.-Commander Rico Botta reports that intake-valve stems with 0.0025 in. chromium plate showed only 0.0007 in. stem wear after 167 hours' operation at the very high b.m.e.p. of 160 lb. per sq. in. The chromium-plate must not extend above the guide, into the flame-swept area, as it then checks and cracks.

Correct supply of lubricant to valve stems is important; too little oil on the stem causes heating and excessive wear, while too much may cause heavy "stewing" at the top of the guide, which eventually will keep

the valve open. Exhaust-valve guides should be cut off at the top of the boss, as any protruding portion is apt to "grow," because of the excessive temperature, and to tilt the valve and feed heat to the valve stem. Nitrided stems are expensive, but work satisfactorily with what would otherwise be inadequate lubrication.

Mr. Colwell suggested that owners be advised to replace valves and guides when the total clearance has increased to 2.5-3.5 times the initial value; guides should be replaced also if they have "bell-mouthed" appreciably at either end.

Considerable work is now being done on surface treatments to reduce wear. The National Bureau of Standards some time ago reported that when two steel surfaces coated with a film of oxide were rubbed together, there was only a slight distortion around the edge of the film, whereas if the same surfaces without the oxide film were rubbed together, they became rough and distorted. Phosphate and oxide coatings have been found to give good wear-reducing results on piston rings and other parts. Jack Gordon of Cadillac Motor Car Co. eliminated chatter in a friction clutch by bonderizing the friction surfaces. He also improved wear conditions on tappet faces by bonderizing the cams, and he is now bonderizing the tappet faces as well, as a possible means to further improvement. L. T. Girdler of Standard Automotive Parts is experimenting with surface treatment of valve guides, and has had some very encouraging results.

Thompson Products has run many wear tests on different material combinations for valve stems and guides, in the machine of which a sketch is shown in Fig. 4. A hard stem material is usually the one which wears least, but it wears the guide more, and the result is similar if a hard material is used for the guide. Hard material in both stem and guide seems the best combination.

Excellent results have been obtained with nitrided valve guides, in which the hard layer on the inner surface extends to a depth of 0.008-0.010 in. The guides are honed, and the clearance is held close. Contrary to the general rule, this hard guide does not wear the valve stem ex-

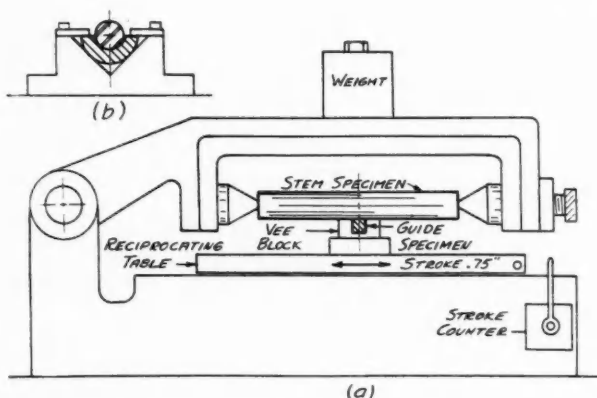


Fig. 4—Wear-testing machine

cessively. Guides of this material are now being used in production in a limited way, in spite of their high cost, and are giving from six to ten times the life of gray-iron guides. These guides must not extend above the boss, so they will not be swept by the flame. Wear of guides can be reduced also by the use of better guide materials, such as nickel-chromium-molybdenum cast iron. Ordinary gray iron has a tendency to grow and "bell-mouth" when exposed to the exhaust flame, which is absent with the alloy irons.

With respect to reducing wear in other parts of the valve train, Mr. Colwell made the following suggestions: Valve-seat wear, pounding and pick-up can be minimized by the use of a good seat insert. Hard seat inserts, which predominate, are low in cost, but must be ground, while soft inserts are more expensive but can be reamed. With the soft inserts the valve seat must be made wider, to reduce the unit impact. Tip wear is minimized by hardening the tips in the case of stems of ferritic steel, and welding hard tips to stems of austenitic steel. Wear throughout the valve train is reduced by the use of automatic take-ups.

In valve-in-head engines, to reduce side thrust on the valve stems it is advisable to have 40 per cent of the rocker-arm travel above center. All contacting surfaces should be well finished; ball or roller contacts would be an improvement, but are expensive. Wear of the valve seat is reduced by the use of hardenable steels or by puddling Stellite onto the seat. Worn rocker arms may be quieted by tin-plating the worn surfaces. The beaded lock of the spring retainer, which obviates looseness, is coming into universal use. Wear on the seat of the intake valve indicates that either the air cleaner is inefficient or that the spring is weak and allows the valve to bounce. Turning of valves seems to lessen wear in the

case of exhausts, but may accelerate it in the case of intakes.

Weak springs allow the valves to flutter, causing leakage and accelerated wear, while excessively stiff springs increase seat wear and cause the valves to "stretch." If the ends of the springs are not flat, side thrust is developed, which results in rapid seat pounding and breakage. Tappet wear is not a serious problem. Most of the barrels are hardened, close clearances are maintained, and lubrication is usually quite profuse. A honed face and surface treatment might make possible further wear reduction. Alignment is a problem that deserves serious attention in L-head engines, as if the tappet strikes the valve off center, it produces side thrust.

Surface Finish

In concluding his paper Mr. Colwell mentioned that one service manager known to him had the following stock answer to complaints sent in with worn parts: "Its designed life has expired." He said the engine designer's and specialist's problem was to extend the normal life expectancy of parts; definite progress was being made in this direction, but at present there were no indications that production ever would be limited by infinite engine life.

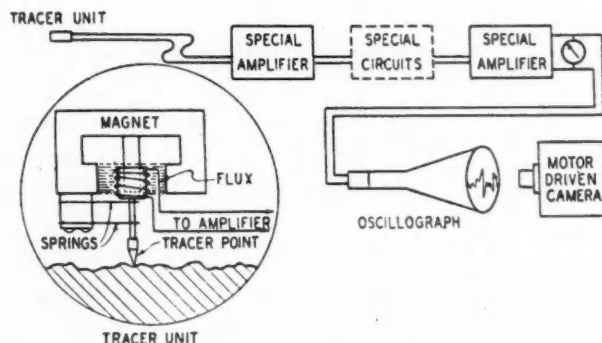
Two leading automobile manufac-

turers and one manufacturer of cylinder liners have recently acquired equipment for surface-finish control, according to Kirke W. Connor, Micromatic Hone Corp., which enables them to limit the mean value of the heights of irregularities to 5 micro-inches in the case of cylinder bores, 5 to 8 micro-inches in the case of pistons, and 1 to 2 micro-inches in the case of crankshaft bearings and many other engine parts. Mr. Connor presented a paper on "Surface Finish as Related to Engine Wear."

The author gave it as an established fact that initial wear is contingent upon, and operating wear is directly affected by the relative surface character of the assembled operating parts. Improved surface finishes, he said, have been made possible by the development of new hydraulic honing equipment for cylinder bores, new mechanical actuation of abrasives on external surfaces, and of an instrument for measuring irregularities in finished surfaces. The new honing equipment permits better control of the unit pressures.

The instrument referred to is the Profilometer, developed by the Phycisists Research Co. of Ann Arbor, Mich. As shown in the diagram, Fig. 5, the tracer method is used, the tracer support being arranged with a tiny coil which operates in the field of a permanent magnet. Movements of the tracer are thus translated into electrical voltages proportional to the velocity of movement. These voltages are amplified and caused to produce vertical magnifications of the displacement of the spot of a cathode ray oscillograph, which are proportional to the displacements of the tracer point. The Profilometer circuit may be adjusted to separate different types of irregularities that exist simultaneously on a surface, that is, roughness and waviness. The readings provided are in micro-inches—root mean square—and represent a running average of the

Fig. 5—Diagram illustrating operating principle of the Profilometer



height of the surface irregularities. This automatic-averaging feature is one of the principal advantages of the Profilometer. Pictorial records of surface profiles may be made by suitable synchronization of tracer speed to film speed. For visual observation, a suitable oscillograph "sweep" can be used.

The new hydraulic equipment previously mentioned is now being used by one manufacturer in large-scale production of cylinder bores. The sequence of operations on the bore includes a rough-boring operation with four-blade piloted bars with Stellite-tipped cutters, which remove 0.120 in. on the diameter. The Pro-

the abrasive members and the work metal is increased. For this reason, slightly coarser stones of much softer grade may be used for rough honing than with mechanically actuated tools.

One manufacturer of six-cylinder engines recently adopted hydraulically-actuated honing tools for a rough-honing operation on the cylinder bores following reaming. This operation in turn is followed by a finish-hone with mechanically-actuated tools, a total of 0.004 to 0.0045 in. stock being removed after the reaming operation. Bores are held to tolerances of 0.0002-0.0003 in. on roundness and straightness, and the

tion is at the rate of about 20 liners per hour and about 73 liners per set of honing stones.

The tool used in this application operates on the following honing cycle: The hone is lowered into the work in a collapsed position, and rotation and reciprocation of the spindle are started. At the bottom of the first stroke, the hone automatically expands to exert light pressure, and it is run for approximately 25 strokes to remove stock to base metal before the normal working pressure cuts in. This pressure remains until the electrical timing device, set at a predetermined time cycle, collapses the tool and releases the line pressure, causing the hone to be automatically withdrawn from the work.

Profilograph records taken on a precision-bored surface (Profilometer reading, 60 micro-inches) and of a finish-honed surface (Profilometer reading, 8 micro-inches) are shown in Figs. 6 and 7 respectively.

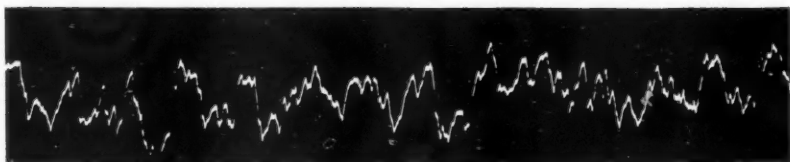


Fig. 6—Profilogram of precision-bored surface

filometer reading for the surface produced by this operation ranges between 150 and 200 micro-inches. The second operation is a semi-finish boring, with three-blade stub bars with Carboloy-tipped cutters, removing 0.020 in. on the diameter, and the Profilometer reading of the surface produced is about 150 micro-inches, which shows that the smoothness is not materially greater than after rough-boring. The third operation is precision-boring with single-point Carboloy-tipped cutters removing 0.015 in. on the diameter, and the surface produced shows 60 micro-inches on the Profilometer. In the final or finishing operation, hydraulically-actuated honing tools are used, which remove from 0.0015 to 0.0020 in. on the diameter, give finish dimensions within 0.0003 to 0.0005 in. of nominal, and a reading of 8 micro-inches on the Profilometer.

The surface finish has been found by this company to have a direct influence on the oil consumption, for whereas with a mean height of bore roughness of 13 micro-inches the oil mileage is only 300 per quart, with 9 micro-inches it is raised to 1500 miles per quart.

Hydraulically-actuated honing tools are designed to operate under variable line pressure during the honing cycle, the pressure increasing as the total contact area between

final surface finish is held to between 3 and 4 micro-inches in regular production.

Another recent application of this equipment is to alloy cast steel cylinder liners for a tractor engine, the liners being $5\frac{3}{4}$ in. in diameter and 15 in. long, and showing a hardness of 45 to 50 on the Rockwell "C" scale. Formerly these liners were rough- and semi-finish-bored, and were then hardened. The hardening produced considerable distortion and had to be followed by a relatively costly grinding operation. With the hydraulically-actuated honing tools now used, as much as 0.012 in. of stock can be removed per minute, which corrects the distortion, thus obviating the need for grinding. At present an average of 0.022 in. stock is removed in the rough-honing operation, leaving approximately 0.001 in. stock for the finish-honing operation. Tolerances are held to 0.0005 in. for roundness and to 0.0007-0.0010 in. for straightness. Produc-

L. B. Sperry of the International Harvester Co., in a paper read in the author's absence by John S. Erskine of the same company, gave results of tests on various materials for cylinder liners, ranging from ordinary cast iron at one end of the hardness scale, to nitrided cast iron imported from England and France and reputed to be of 900 Brinell hardness, at the other, with such intermediate materials as nickel-chromium-molybdenum cast iron untreated, the same cast iron heat-treated, chilled iron with various nickel and chromium contents, centrifugal cast iron of low hardness, centrifugal cast iron of high hardness, Ni-Resist, electric-furnace iron, 35 per cent chromium iron, etc.

These liners were tested in field operation covering 12,000 hours. One thing that was learned was that wear is not necessarily lowest with the hardest material; in fact, the lowest wear was shown by a material of only 250 Brinell. However, the material showing the lowest rate of wear is not necessarily the best for the purpose, because this particular

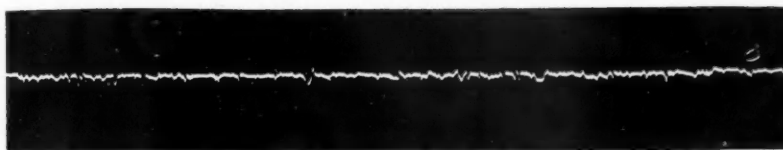


Fig. 7—Profilogram of finish-honed surface

material is expensive and hard to produce, and while not hard to machine, is very difficult to hone, and, worst of all, has a tendency to scuff easily. Very extensive tests made with heat-treated liners and with liners of the same material but not heat-treated, showed that the rate of wear was four times as great with the untreated material, on the average.

Mr. Sperry expressed the opinion that of the various materials now available for wet cylinder liners, nickel-chromium-molybdenum iron, heat-treated, is one of the best. A very interesting development on the way, both in this country and abroad, is a thin dry liner which is nitrided to 1000 Brinell.

In its four-cylinder engines having two ball-type main bearings on the crankshaft, the International Harvester Co. has been using S.A.E. Nos. 3140 and 4140 steel for the crankshafts, the last-mentioned being the material now used, which is heat-treated to a minimum hardness of 321 Brinell. When the Diesel engine was introduced, the company realized that the conditions of crankshaft service would be more severe, and for the four-cylinder engine a five-bearing crankshaft design was adopted from the start. At first the bearings were hardened by locally heating the bearing surfaces by means of an acetylene torch (as in the Doppl-Duro process used in Germany), and quenching immediately by means of a water spray; but when the hardening method by electric-induction heating became available, that method was adopted. By using a steel very similar to S.A.E. No. 1050, a minimum surface hardness of Rockwell "C" 57 is obtained, which is nearly file-hard. The electrodes of the machine are so designed that the fillets are not hardened. The modified No. 1050 steel is considerably cheaper than the alloy steel used for the ball-bearing crankshafts, and is heat-treated to a minimum of 250 Brinell. Before hardening, the whole crankshaft is given a tempering treatment for strain relief. Wearing surfaces on these crankshafts are much harder than those produced by any other process, with the possible exception of nitriding and case-hardening, and field service has shown a much longer service life than is obtained with unhardened shafts.

Dust-House Testing

In the past we have been testing internal combustion engines in cold rooms, in silent rooms, and even in

vacuum rooms, also known as altitude chambers, but hereafter the "compleat" engine factory will have to have one more item of test equipment—the dust room. Such a dust room or dust house was described in a paper by Howard M. Wiles of Waukesha Motor Co. It is essentially a large box, 6 ft. wide, 10 ft. long, and 7 ft. high, made from composition board, with all joints sealed with rubber beading and masking tape. Panel construction makes it portable and accessible. Observation windows and suitable interior illumination are provided. It is located in Waukesha's engine-breakdown department, where suitable water, exhaust and electrical connections and power-absorbing equipment are available. A steady supply of dust is fed into the room by means of a Schwitzer-Cummins coal stoker, and the dust is kept in suspension in the air by two electric fans. After a hopper-full of dust has been fed to the room, it can be shoveled off the floor, and used over, provided it has not been wetted by oil or water.

From the engine on its stand a drive shaft extends through a felt seal in the rear panel to a fan dynamometer in an outside housing. In order to maintain a uniform temperature in the completely-sealed dust house, it is necessary that the heat given off by the engine be removed in some way. The regular engine radiator with its fan is used for this purpose, cold city water being forced through the radiator at a suitable rate. Engine cooling, on the other hand, is effected by circulating water from an outside cooling tank through the jackets.

The dust used for testing is obtained in steel barrels from North Dakota, and consists of fine volcanic ash having abrasive properties. In the dust house, tests are conducted on air cleaners, carburetors, crankcase breathers, shaft seals, generators, starters, etc., all tests being conducted in essentially the same way, a uniformly dust-laden atmosphere being maintained for the duration of the run. But in checking cylinder-bore wear it has been found expedient to run without an air cleaner, allowing the engine to breathe dust directly through the carburetor until it has worn out.

One result of tests in the dust house was that a special liner material was shown to have a much greater resistance to bore wear than the standard grey iron, and that with these special liners the wear on the pistons and rings was also greatly reduced. In this test, two bores of

the four-cylinder test engine were in the standard cast iron and two in the special liner material. In another test, in which all of the bores were in the special material, a check was made on crankshaft wear, and it was found that after 10 hrs. the main bearings had been reduced 0.010 in., and the crankpins had worn egg-shaped, measuring 0.022 in. less in one direction and 0.006 in. less in the other, which was only a slight improvement over results with the standard cylinder material. The conclusion was drawn that dust collects in the oil film and is carried with the blow-by into the crankcase. It was found that under the special conditions of these tests, wear on valves, valve guides and tappets is much less than that on the cylinder bores, rings, crankshaft and crankshaft bearings, and that the wear on the piston skirt is only about one-tenth as much as that on the cylinder bore.

Tests with specially - prepared bores, the author said, indicated that cylinder wear under the most adverse conditions can be cut to from 10 per cent to 15 per cent of what it is normally. This suggested the practicability of the use of low-cost, L-head engines for small tractors, in place of the more expensive valve-in-head type with removable liners, especially in view of the fact that, according to some figures presented at the meeting of the American Society of Agricultural Engineers at Chicago last December, amortization of the first cost of the tractor may account for 40 per cent of the hourly operating cost, and with a reduction in the first cost the amortization naturally decreases.

Macy O. Teetor of Perfect Circle Company presented the sound film on Piston Rings and Cylinders which was shown at the S.A.E. annual meeting. C. M. Larson of Sinclair Refining Co. spoke briefly on Lubrication, with special reference to tractor lubrication problems. Much of the difficulty in tractor lubrication is due to the great variation in the fuels used, extending from high-octane gasolines having an initial point of around 100 deg. Fahr. and an end point of about 400 deg., to so-called distillate which may have an initial boiling point of 400 deg. and an end point as high as 800 deg. Mr. Larson also mentioned the use of addition agents in lubricants, but emphasized the point that these could not be used with certain of the newer types of bearing material, as they were acid in character and attacked these materials. He had

come to the conclusion that for the lubrication of high-speed Diesel engines a mid-Continent naphthenic-base oil was superior to a paraffinic oil, as it carbonizes less and therefore gives less trouble from ring sticking.

E. S. Twining of Champion Spark Plug Company gave a brief talk on Spark Plugs. He emphasized the importance of selecting a plug of the proper heat characteristics for tractor service.

Pressure Indicator Has Automatic Correction Feature

(Continued from page 577)

firing pressures. On compression pressure, water cooling is not required.

The neon light flasher is a separate unit which can be held in the hand or be suspended from the neck of the observer. Connection between the neon light flasher and the indicator is made by means of a cord with plug connections for insertion into the jacks N on the side of the indicator. The current source for the neon light is an ordinary flashlight battery located in the flasher case.

The standard model reads up to 1200 lb. per sq. in.

Buick Control Laboratories Assure Quality

(Continued from page 569)

ment, a Lindberg drawing furnace, a Dilatometer, and other items.

4. Store Room—contains storage space for miscellaneous as well as chemical equipment. In this area also will be found a large salt spray chamber which is used for testing coatings.

5. Pyrometer Room—contains work benches and equipment required for the testing and repair of production pyrometer equipment.

6. Sampling Room—serving the other laboratories is provided with various kinds of metal working equipment for the preparation of samples for physical testing and chemical analysis. Prominent among the equipment is a compact and versatile Krause metal cutting machine combining a full-sized lathe, a milling machine, and a drill press, contributing largely to conservation of productive space. Another new machine is a low pressure Pangborn shot-blasting machine which is used

for cleaning metal samples, removal of scale, etc. Three high speed cut off saws, two small saws, and a new band saw complete the larger items of equipment.

With this perspective of the general organization scheme and laboratory facilities, it becomes clear that Buick's metallurgical department truly is well fitted to offer not only the usual scientific laboratory facilities and services, but what is more important, it provides inspection and controls that assure specification quality of the manufactured prod-

uct. At Buick, the metallurgical department constitutes, in a sense, the best assurance of consumer acceptance.

Gar Wood Shifts Bus Plant

Gradual transfer of the motor coach division of Gar Wood Industries, Inc., from plant 4, Highland Park, Detroit, to the company's plant in Marysville, Mich., was revealed by H. Sydney Snodgrass, general manager of the motor coach division.

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Seamless
Tubing

Electric Welded
Tubing

TOOLS OF TOMORROW

(Continued from page 565)

end or double end, for boring from one end or both ends.

Boring heads are mounted on the bridge which has capacity for holding from three to seven heads. Heads are driven by "V" belts and speeds can be varied by changing pulleys. The table has a large scraped pad with three T-slots for holding fixtures.

The boring heads at each end of

the machine are driven by individual D.C. motors which, with their own jackshafts, are mounted on separate sub-bases at the rear of the machine. Motors are of the variable speed type controlled by a rheostat at the front of the machine for varying the speed of the boring heads.

The No. 45 has capacity to handle several sizes of head-stocks. The table is 104 in. long by 36 in. wide

with a scraped pad 54 in. by 28 in. Both bridges are set back on the pads of the machine base to give a distance of 70 $\frac{3}{4}$ in. between bridges. Boring heads are mounted on raising blocks. Stroke of the machine is 30 in.

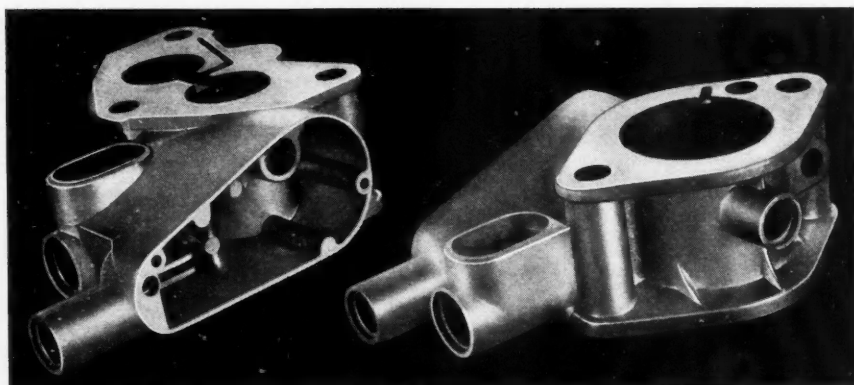
Spot Welder

... Eisler's latest model has features not built into previous designs.

Eisler Engineering Co., Newark, N. J., recently supplied a new model spot welder for service in South America which embodied in the design a number of features that heretofore were not incorporated into the company's line of spot welding machines. Designated as No. 600-CFO, this model has a rated capacity of 75 KVA. It can also be supplied in 35 to 500 KVA sizes.

A $\frac{3}{4}$ -hp. Reeves variable speed drive and safety clutch provide a range of from 20 to 150 strokes of the upper electrode per minute. An

ALUMINUM AND ZINC BASE DIE CASTINGS



The castings pictured above are made in aluminum and are used for governors for automobiles.

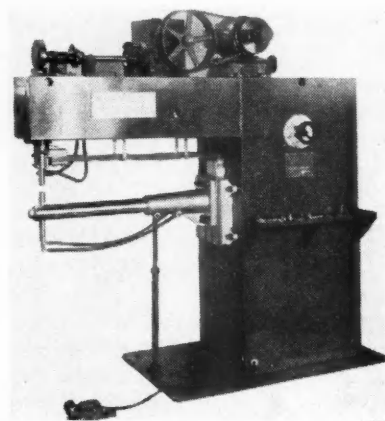
The No. 1 prerequisite for castings of this nature is density, and Paragon has zealously insured this by producing all die castings in die casting machines developed in the Paragon plant expressly for this purpose.

Today leading automobile and parts manufacturers turn to Paragon for aluminum and zinc base die castings that will finish smoothly. Why not do the same the next time you need aluminum and zinc base die castings?

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New Eisler spot welder

overhead driving cam gives the following upper electrode a stroke of 1 $\frac{1}{2}$ in., although any desired stroke may be built into the machine to specification.

Mounted on the same camshaft as the overhead driving cam is an additional cam which is adjustable and acts as a timer in regulating current dwell. An automatic timer is supplied with the contactor for more sensitive control.

Throat depth of this machine is 36 in. and other depths between 12 and 48 in. may be obtained. The lower electrode is adjustable both horizontally and vertically. Water-cooled electrode holders are standard equipment.